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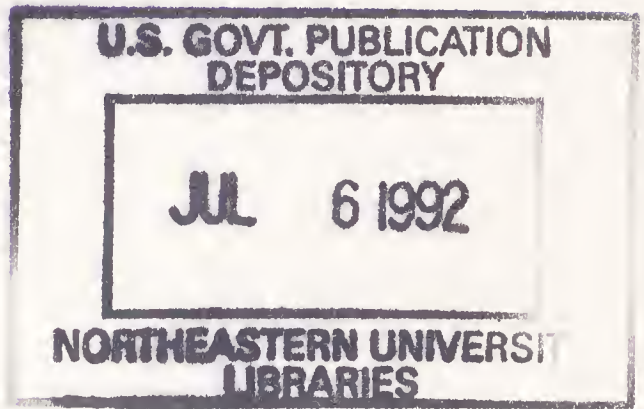


Figure 1 is a line graph showing the percentage of total energy expenditure (TEE) for different activities over a 24-hour period. The Y-axis is 'Percentage of TEE' (0-100) and the X-axis is 'Time of Day' (0-24). The activities and their approximate percentages are:

Time of Day	Sleeping	Resting	Sitting	Standing	Walking	Running
0	50	10	10	10	10	10
4	60	10	10	10	10	10
8	50	10	10	10	10	10
12	40	10	10	10	10	20
16	30	10	10	10	10	30
20	20	10	10	10	10	40
24	50	10	10	10	10	10

2000

ANTARCTIC BIBLIOGRAPHY

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STUART G. HIBBEN, EDITOR

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Introduction

This volume is the nineteenth in a continuing series of compilations presenting abstracts and indexes of current Antarctic literature published since 1962. A companion volume to the series, *Antarctic Bibliography; 1951–1961*, extends the coverage retrospectively.

The material has been compiled over a period of 12 months; the cut-off date for inclusion in this volume was December 1991. To provide current awareness, the abstracts have also been distributed as 12 monthly bulletins under the title *Current Antarctic Literature*. The bulletins are generated from a computerized database which is also used in producing this cumulated listing and the indexes.

The present volume contains abstracts numbered from 42,876 to 45,062; these first appeared in issues no. 221 through 232 of *Current Antarctic Literature*. The first five volumes each contained 2,000 abstracts. Thus, items 1–2,000 appeared in volume 1 (published in 1965), items 2,001–4,000 in volume 2 (1966), items 4,001–6,000 in volume 3 (1968), items 6,001–8,000 in volume 4 (1970), and items 8,001–10,000 in volume 5 (1971). Volume 6 (1973) contained items 10,001–12,244, volume 7 (1974) items 12,245–14,447, volume 8 (1976) items 14,448–16,899, volume 9 (1977) items 16,900–19,248, volume 10 (1979) items 19,249–21,721, volume 11 (1980) items 21,722–24,083, volume 12 (1982) items 24,084–26,452, volume 13 (1983) items 26,453–28,961, volume 14 (1985) items 28,962–31,756, volume 15 (1986) items 31,757–34,660, volume 16 (1988) items 34,661–37,522, volume 17 (1989) items 37,523–40,798, and volume 18 (1990) items 40,799–42,875.

The material is arranged in sections representing thirteen subject categories (see table of contents). Items that apply to two or more categories are listed in one section only and cross referenced at the end of the other pertinent sections. Because of this scheme of arrangement, some items dealing with the same subject (from different aspects) will be found in two different categories; e.g. some papers on marine sediments may be found in Section E (Geological Sciences), and others in J (Oceanography). Within each section, abstracts are arranged by accession number; the indexes are keyed to these numbers.

Foreign-language titles are given in English translation first, with the original title following in brackets. Transliteration of Cyrillic and romanization of oriental languages follow the Library of Congress systems. Some of the citations are followed by library call numbers, preceded by the library symbols commonly used in union catalogs.

As a rule, the abstracts are informative rather than descriptive, but no attempt is made to verify or critically evaluate the author's statements or conclusions. Author abstracts are either used unchanged or modified for the sake of brevity or conformity to guidelines adopted for this bibliography.

Four indexes are provided: (1) an author index that includes coauthors (anonymous journal articles are referred to under the journal name); (2) a subject index that occasionally extends to two levels of subheadings and contains crossreferences; (3) a geographic index to names of places, stations, and geographic features as approved by the U.S. Board on Geographic Names; and (4) a grantee index to names of organizations or institutions that received financial support from the National Science Foundation for work that resulted in publications abstracted in the volume. In each index, entries are cited by a letter, indicating the subject category, followed by the accession number: for example, B–42469 refers to section B, Biological Sciences, item number 42469.

Although the majority of the publications abstracted are in the collections of the Library of Congress, many significant items were lent by or exchanged with other institutions, made available by the Division of Polar Programs of the National Science Foundation, or received as review copies or reprints directly from publishers and authors. Because they contribute to more current and complete coverage, review copies and reprints are especially valuable, and publishers and authors are encouraged to send them to the Library of Congress, Science and Technology Division, Cold Regions Bibliography Project, Washington, D.C. 20540, U.S.A.

Requests for photoreproductions of documents cited in this bibliography, except material protected by copyright, should be directed to the Library of Congress, Photoduplication Service, Dept. C-177, 10 First Street SE., Washington, D.C. 20540. U.S. government or government-sponsored technical reports may, in most cases, be obtained from the National Technical Information Service, Springfield, VA 22151. For such reports, NTIS order numbers are usually included in the bibliographic citation.

Stuart G. Hibben, *Head*
Cold Regions Bibliography Project
Science and Technology Division
Library of Congress

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A. GENERAL

A-42966

Guo, K., ed, Chinese Committee on Antarctic Research, **Proceedings of the International Symposium on Antarctic Research**, Tianjin, China Ocean Press, 1989, 540p., Refs. passim. For individual papers see A-42967; B-42998 through B-43009, B-43011, E-42973, E-42975 through E-42987, E-42989 through E-42992, E-42995, F-42968 through F-42972, F-42974, H-43012 through H-43014, I-43019, I-43021 through I-43026, I-43034, J-43010, J-43015 through J-43018, K-42996, K-43020, K-43027 through K-43033, K-43035, L-42988, L-42993, L-42994, L-42997; or 45-1004 through 45-1012.

This volume contains a collection of papers presented at the International Symposium on Antarctic Research, mainly by Chinese scientists working in the areas of glaciology, geography, geology, geophysics, biology, medicine, physical and chemical oceanography, meteorology, and upper atmospheric physics. Much of the data reported was obtained at the Great Wall Station

A-42967

Guo, K., Dong, Z., **Review of Chinese antarctic research in the past ten years**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.1-7, 9 refs.

The present paper reviews the development and achievements of the Chinese antarctic research and scientific programs which have been carried out in several fields in 1980-1989. Studies of Late Quaternary geology and geography, oceanography, glaciology, meteorology, biology, geophysics, geology and upper atmospheric physics are outlined. (Auth. mod.)

A-43073

Antarctic wilderness, *Nature*, Nov. 22, 1990 348(6299), p.267-268.

This editorial deplores the proliferation of research programs of marginal interest along the margins of Antarctica. Much of this research is too ill-defined to deepen understanding of any kind. With the renunciation of the minerals regime convention, it also urges the necessity of dealing with crustal projects separately from other programs. This would allow continuing gathering of tectonics data, and at the same time provide a means for testing for the presence or absence of significant mineral deposits in the antarctic crust. A corollary to this premise is full disclosure of the results of all programs at regular meetings of scientists, investigators, and program managers, and to make these results generally available within a reasonable time.

A-43079

Forget, C., **Laboratoire de Glaciologie et de Géophysique de l'Environnement** [Le Laboratoire de Glaciologie et de Géophysique de l'Environnement], *Neige et avalanches*, Oct. 1990 No.52, p.13-15, In French.

This brief article describes the fundamental research activities of the Laboratoire de Glaciologie et de Géophysique de l'Environnement, an organization with headquarters in Grenoble, France. Included in its research mission is a substantial commitment to glaciological studies in Antarctica.

A-43093

Naveen, R., Monteath, C., De Roy, T., Jones, M., **Wild ice: Antarctic journeys**, Washington, DC, Smithsonian Institution Press, 1990, 222p.

This work is a primarily photographic compendium of the ecosystem of Antarctica. Each author/photographer/naturalist devotes a chapter—based on his or her personal experiences—to a given topic; dramatic color photographs are accompanied by vignettes. The final chapter, entitled “Perspectives on Antarctic Photography,” provides detailed information for photographers who might be embarking on a trip to Antarctica. Advice is offered on clothing, gear bags, camera bodies, auto-wind mechanisms, lenses, tripods, filtration, film, exposure, lighting, composition, depth of field, working with the wildlife, and snow photography. The authors offer this work as a testament to the pristine nature of Antarctica, and emphasize the need for concerted international efforts to maintain it that way.

A-43124

Bleil, U., ed, Thiede, J., ed, **Geological history of the polar oceans: Arctic versus Antarctic**, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, 823p., Proceedings of the NATO advanced research workshop held in Bremen, FRG, Oct. 10-24, 1988. For selected papers see E-43125 through E-43129, E-43132, F-43130, F-43131, J-43133 through J-43139, or 45-1266 through 45-1270.

DLC QE350.6.N38 1988

During the Advanced Research Workshop, papers were presented covering arctic as well as antarctic studies. A major effort was devoted to the comparison of the Cenozoic histories of the modern polar deep-sea basins of both hemispheres. This book addresses the physiography and plate tectonics of the polar deep-sea basins and their continental margins; the polar ice-covers as geological agents; contemporary depositional environments of polar oceans; the Quaternary history and paleoceanography of the northern polar deep-sea basins and of the southern ocean, and, finally, pre-Quaternary records of polar ocean history. Many of the papers contained in this book identify major unsolved scientific problems, thus offering new perspectives for future geoscientific research in the polar regions. Expeditions to the polar regions in recent years, together with progress in deep-sea drilling techniques and the new ice-breakers which are available now, or in the near future, have provided the means for renewed polar research efforts to unravel important unsolved questions related to the geological history and characteristics of the polar oceans. (Auth. mod.)

A-43146

Beck, P.J., **Antarctica enters the 1990s: an overview**, *Applied geography*, Oct. 1990 10(4), p.247-263, 37 refs.

During the 1980s Antarctica's increased international importance reflected in part the greater political and public awareness of environmental issues. This trend will continue into the 1990s, for Antarctica performs an integral role in global environmental systems. The ozone problem has highlighted the manner in which antarctic research possesses both a polar and a general relevance. The region's future value will lie primarily in the sphere of scientific and environmental investigations rather than the exploitation of oil and natural gas, although tourism represents a growth area. The merits of the Antarctic Treaty system as a management regime for the region also figure on the international agenda, and during 1989 the controversy surrounding the minerals regime imparted an added edge to this debate. An-

tarctica's intrinsic interest as an area for research is reinforced by the manner in which it acts as a useful case study for a range of general issues of relevance to geographers, who should no longer treat it as 'a pole apart'. (Auth.)

A-43147

Walton, D.W.H., Morris, E.M., **Science, environment and resources in Antarctica**, *Applied geography*, Oct. 1990 10(4), p.265-286, Refs. p.284-286.

The International Geophysical Year provided a sound foundation for the development of antarctic scientific activity in a wide range of disciplines, including glaciology, atmospheric sciences and medicine. The intrinsic value of research in Antarctica is reinforced by its relevance to an improved understanding of global environmental systems; stratospheric ozone depletion was first identified at Halley Station. Minerals, as yet unproven, have highlighted the conservation problems inherent in the utilization of any antarctic resources. Marine living resources are at present under threat of over-exploitation in some areas. The 1990s hold the promise for a brighter scientific future for Antarctica, but only as long as the Antarctic Treaty system continues in operation. (Auth. mod.)

A-43150

Wace, N., **Antarctica: a new tourist destination**, *Applied geography*, Oct. 1990 10(4), p.327-341, 10 refs.

The scenic beauty and wildlife attractions of Antarctica, in conjunction with its remoteness, have encouraged the growth of tourism in the region. There has also occurred a limited amount of adventure tourism. The nature and future possibilities of antarctic tourism can be classified according to the mode of transport employed to reach Antarctica. Airborne and seaborne tourism are the chief categories, and the 1990s are likely to witness the continued growth of tourism to the region, especially if improvements in air communications succeed in qualifying the existing problem of inaccessibility. Careful consideration should be given to the scientific and environmental implications of this process for both the antarctic continent and islands in the southern ocean. (Auth.)

A-43151

Beck, P.J., **Regulating one of the last tourism frontiers: Antarctica**, *Applied geography*, Oct. 1990 10(4), p.343-356, Refs. p.354-356.

The antarctic continent has remained relatively unaffected by tourism, one of the world's fastest growing industries, even if recent decades have witnessed an ever-increasing rate of growth in tourist numbers. Although the 1959 Antarctic Treaty made no provision for tourism, the situation is not completely unregulated. The Antarctic Treaty parties have already adopted recommendations to cover specific problems, while national legislation regulates the activities of tourists from certain countries. Nevertheless, there are grounds for concern, and the perceived inadequacies of the existing arrangements have prompted debate regarding the respective merits of either the adoption of further national legislation or the introduction of an antarctic tourism regime. (Auth.)

A-43213

Harrowfield, D.L., **Conserving Antarctica's earliest historic buildings**, *New Zealand antarctic record*, 1990 10(3), p.3-11, 5 refs.

Cape Adare, in north Victoria Land, is a historic site located on a 73 hectare cusped foreland at the northwest end of the Adare Peninsula. Present are three buildings, one in ruins, and a variety of artefacts from the two "heroic-era" expeditions, including the Southern Cross Expedition of 1898-1900. In summer of 1989-1990 an expedition undertook the restoration of one of the buildings, Borch-

grevink's living hut. Major work on the hut, including excavation of the stores hut, is described. An inventory of the artefacts on the site is presented and problems of conservation of the site are discussed.

A-43331

Abbott, S.B., **Polar Research Board: antarctic-related activities, July 1988 through June 1989**, *Antarctic journal of the United States*, 1989 24(5), p.274-275.

The Board is a policy-making group of 21 scientists primarily from academia but also including scientists of corporate, Federal, and State entities. It meets semiannually to review current programs and to discuss needs or questions which may result in new studies. During the year noted, the Board reviewed the progress of the 1986 plan for antarctic programs in the year 2000 and beyond, emphasizing the need for solutions to man-made problems, including the antarctic ozone depletion and the role of Antarctica in global environmental changes. SCAR activities are reviewed; preparations have been initiated for the July 1990 SCAR meeting in Sao Paulo.

A-43333

Thuronyi, G.T., **Antarctic Bibliography issued in new format**, *Antarctic journal of the United States*, 1989 24(5), p.277-278.

The progression of the *Antarctic Bibliography* is reviewed as its preparation methods moved from a hand crafted product to computer-generated assemblages, and accessibility increased from a limited number of users to a world-wide set of potential customers through a commercial data vendor. The most recent step in the technological advance is the development of a CD-ROM capability for the entire Cold Regions data base, containing more than 147,000 bibliographic records, of which over 40,000 are relevant to the Antarctic.

A-43344

Sovetskaia antarkticheskaia ekspeditsiia, Maksutov, D.D., ed, **Twenty-seventh Soviet Antarctic Expedition. Studies of the 1981/82 season** [Dvadtsat' sed'maia Sovetskaia antarkticheskaia ekspeditsiia. Sezonnnye issledovaniia 1981/82 gg.], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.86, 177p., In Russian. Refs. passim. For individual papers see 45-1561 through 45-1565 or F-43345 through F-43348, F-43350, and J-43349.

This volume contains information on observations and results of scientific efforts carried out by the 27th Soviet Antarctic Expedition in the 1981-1982 season on the antarctic continent and surrounding waters. Seasonal activities and organization of the expedition, including logistic support and contact with non-Soviet expeditions, are outlined in the first part of the book. The second part consists of 6 individual papers giving the scientific results of projects in oceanography and glaciology.

A-43373

Kriwoken, L.K., **Antarctic environmental planning and management: conclusions from Casey, Australian Antarctic Territory**, *Polar record*, Jan. 1991 27(160), p.1-8, 22 refs.

The Australian Antarctic Division's ten-year (1985-95) A\$76.704 million program of rebuilding and expanding stations in Australian Antarctic Territory is representative of a continent-wide increase in station numbers and impact, increasing station size, human numbers, lengths of roads, buildings, waste material production, and energy requirements. Environmental planning and impact assessment have not been incorporated in official decision-making; human activities at Australian Antarctic Territory stations had serious impacts on the limited ice-free land and local flora and fauna. Casey, a re-developed station, is examined with reference to environmental planning and management under Antarctic Treaty obligations and recent Australian environmental legislation. Recommendations in-

clude the setting up of an Australian Antarctic Resources Committee responsible *inter alia* for environmental planning and management, including regional and station management plans and cumulative and environmental impact assessment for all antarctic operations. (Auth. mod.)

A-43377

Harris, C.M., **'New Zealand in Cambridge Week': an antarctic celebration**, *Polar record*, Jan. 1991 27(160), p.64-65.

A 'New Zealand in Cambridge Week', held June 25-29, included a 'Symposium on Antarctica and Global Climatic Change' to provide opportunities for scientists from the UK and New Zealand to get together and discuss their research on problems related to Antarctica and climatic change. About 100 delegates, mostly from the UK but with a significant proportion of New Zealanders and some from other countries, attended the two-day symposium at Selwyn College, Cambridge.

A-43378

Scientific Committee on Antarctic Research, **SCAR bulletin No.100, January 1991**, *Polar record*, Jan. 1991 27(160), p.71-75.

This issue contains meeting reports of the Council of Managers of National Antarctic Programmes, held in Sao Paulo, Brazil, July 17-20, 1990; the Standing Committee on Antarctic Logistics and Operations (SCALOP), held at the same time and location as the above; and the Working Group on Glaciology, held in Seattle, WA, Aug. 20-24, 1989, respectively. A major topic of the 2 meetings in Brazil was marine pollution; recommendations include implementation of waste disposal—and oil spill prevention—measures. The Working Group on Glaciology discussed the status of past and future international research programs, reviewed past recommendations, re-adopted 2 of them and adopted 2 new recommendations. These deal with the need for elevation measurements, radio-echo sounding, laser altimetry, and studies on ice shelves and associated oceanographic systems, respectively.

A-43433

Hawke, R.J.L., **Australia's policy in Antarctica**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.17-21.

In this address, the Prime Minister of Australia states the position of his Government regarding the continuity of the Antarctic Treaty System into the 21st Century: that it should survive, but to do so it must demonstrate it can deal responsibly and openly with the protection of the antarctic environment. An argument is made backing up the conviction that the Minerals Convention is flawed, leading to the decision by Australia, with France, to pursue the initiative of a comprehensive environmental protection convention which will establish Antarctica as a 'Natural Reserve—Land of Science.'

A-43434

Woolcott, R., **Challenges and changes**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.21-28.

On the premise that the Antarctic Treaty will need both to adjust to anticipated changes and to seek wider public support and understanding in the '90s, three broad issues are addressed: the challenges and changes which the Treaty currently faces and will face in the coming decade; the way in which the parties to the Antarctic Treaty can be expected to respond to these challenges and changes; and the continuing value and validity of the Antarctic Treaty System in the future. The belief is expressed for the need to continue to deal with all issues relating to Antarctica through the Antarctic Treaty System.

A-43435

Quilty, P.G., **Antarctica as a continent for science**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.29-37, 10 refs.

The role of science within the antarctic arena, including the time before the existence of the Antarctic Treaty, is reviewed and its role in the development of the Treaty System is outlined. Rapid changes in antarctic science, away from predominantly pure, basic science towards more directed research, are noted. It is feared that if too high a proportion of antarctic science is directed, there may be criticism in the long term that the Antarctic Treaty System is a club for those with other than pure goals for the region. Predictions involving changes in remote sensing, geographical and other data access systems, publication modes, and integrated research on larger data bases, are presented.

A-43436

Davis, B., **Science and politics in antarctic and southern oceans policy: a critical assessment**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.39-45, 15 refs.

In delineating the conjunction between science and politics, it is pointed out that the issue of antarctic science cannot easily be separated from other national research policies or modes of domestic policy making. If the scientific community is to continue to play a significant role in antarctic affairs, it will have to persuade governments and communities alike that scientific research in Antarctica produces both basic long term benefits and immediate relevant knowledge of value to society; and it will have to take a provocative and educational role in environmental conservation of the continent.

A-43437

Beeby, C., **Convention on the regulation of antarctic mineral resource activities and its future**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.47-60.

After reviewing the role of New Zealand in identifying the need for a comprehensive regime governing the antarctic minerals, the author outlines events leading to the adoption of the Minerals Convention on June 2, 1988. The nature and structure of the Convention are described. In reference to the protection of the environment, the safeguards incorporated in Article 4—setting forth standards on prospecting, exploration and development—are analyzed. In considering the future of the Minerals Convention, it is deemed likely that it will, in due course, enter into force, supplemented by a Protocol, as envisaged in Article 8, that could go some way to accommodating the position of those countries which currently do not favor the Convention. The difference between the Minerals Convention and the alternative to it is examined, with the conclusion that the common view of all Antarctic Treaty parties that it is desirable to have rules to deal with the possibility of mining in Antarctica, is a well founded one.

A-43438

Powell, D., **Antarctic marine living resources and CCAMLR**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.61-70.

The status of the exploitation of antarctic living resources, especially that of krill and finfish, is reviewed, and the role of CCAMLR in the management and research seeking to conserve the entire antarctic ecosystem, not only the commercially targeted species, is dis-

cussed. The difficulties in establishing a system to enforce compliance with conservation measures are examined, as is the past performance of CCAMLR and the future challenges it faces. It is concluded that it will need a continued commitment from its members, and to achieve this perhaps the profile of CCAMLR in its Members' countries will need to be raised.

A-43439

Law, P., **Antarctic wilderness—a wild idea!**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.71-80.

The proposal to declare Antarctica a World Wilderness Park is contested on the premise that the threat to the antarctic environment—from possible exploration and exploitation of antarctic resource activities—is not nearly as serious as conservation agencies have proclaimed. By outlining certain facts dealing with antarctic geography, climate, geology and ecology, the author makes the argument that more than 99% of the continent will always remain a wilderness, no matter what man may do. Also cited are conservation measures already put in place by the Antarctic Treaty nations, and the possibility of an international agreement for a minerals convention, which are considered sufficient to render the proposed declaration unnecessary.

A-43440

Kimball, L.A., **Conservation and antarctic policy-making. A. The antarctic conservation agenda**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.81-90.

Comments on antarctic conservation issues, including the Australian proposals and the agenda for reform in Antarctica, begin with an overview of the future conservation agenda and continue with a review of the recent and current developments in the Antarctic Treaty System. Views on how to make progress on the conservation agenda and the factors affecting that progress are presented. The worst possibility envisaged would be that neither CRAMRA nor any alternative agreed means to deal with minerals activities is in place, or that the rules be negotiated under extreme pressure. It is feared that prospecting could then take place without the environmental impact assessment and other requirements in CRAMRA, and without any provisions on liability for environmental damages caused by prospecting.

A-43441

Goldsworthy, L., **Conservation and antarctic policy-making. B. World Park Antarctica: an environmentalist's vision**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.90-93.

The awakening public interest in the effects of the substantial increase in the level of human activity in and around Antarctica, the increasing number of marine oil spills and shipping accidents in the world, and the value of the Antarctic as a scientific laboratory in assessing global environmental impacts, are brought forward as arguments in favor of declaring Antarctica a protected wilderness, a 'World Park'. The author finds that the presentation of CRAMRA as a means to protect Antarctica from mining activity is puzzling, and the pressure to implement CRAMRA immediately not justifiable.

A-43443

Triggs, G., **Comprehensive environmental regime for Antarctica: a new way forward**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.103-118.

Reasons why CRAMRA was negotiated in the first place, and why it is now perceived to be inadequate, are examined; proposals being considered for a comprehensive environmental regime are described. Protective measures, such as categories of activity, environmental impact assessment, monitoring, zoning scheme, prevention and response action, liability, enforceability, and status of the regime are discussed. Several options for permanent institutional machinery of the regime are considered.

A-43444

Bush, W.M., **Antarctic Treaty System: a framework for evolution—the concept of a system**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.119-179, 261 refs.

In an attempt to characterize the Antarctic Treaty System and its potential for further evolution, an analysis is made of the Antarctic Treaty, the agreed measures for the conservation of antarctic fauna and flora, the antarctic seals convention, the CCAMLR, and the CRAMRA, in the light of two sorts of purposes: active objectives, or activities which an instrument is intended to promote, and passive considerations, or the instrument's static purposes or positions which it is intended to protect. The idea of a comprehensive environmental protection regime, such as Australia and France have proposed, is examined against the result of this analysis. It is concluded that such a regime is a viable goal at this stage, and probably an essential one, to meet the current challenges to the Antarctic Treaty System.

A-43445

Heap, J.A., **Antarctic sovereignty: a source of stress?**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.181-187.

The concept that sovereignty is neither constructive nor destructive is examined, with a review of what effect claims to territorial sovereignty have had in Antarctica—including the first claim by the United Kingdom in 1908, and the challenge to that claim by Chile and Argentina in 1947—the IGY and international research in the Antarctic, the signing of the Antarctic Treaty, and the negotiation of CCAMLR and CRAMRA. It is concluded that sovereignty has been a source of constructive stress, and that the consequences of sovereignty and the existence of opposing views about its expression in the Antarctic have been benevolent.

A-43446

Edmar, D., **United Nations and the Antarctic Treaty**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.189-192.

The point is made that in the United Nations and in the Antarctic Treaty the world has two remarkable instruments for peaceful cooperation and development. Both the UN Charter and the work of the UN, and the Antarctic Treaty System aim at maintaining world peace and security and constructive development in a number of areas of activity.

A-43459

Hay, J.E., ed, Hemmings, A.D., ed, Thom, N.G., ed, **Antarctica 150: scientific perspectives, policy futures**, Environmental science. Conference, Auckland, New Zealand, Sep. 8, 1990. Proceedings, Auckland, University of Auckland, 1990, 89p., Refs. passim. For individual papers see A-43464 through A-43467, A-43469, B-43461 through B-43463, E-43460 and M-43468.

The volume includes a series of presentations by University of Auckland researchers and other scientists involved in antarctic research, highlighting the scientific, legal, political and other human imperatives influencing antarctic policy. The papers were presented at a conference held in Auckland, New Zealand, Sep. 8, 1990.

A-43461

Hay, J.E., **Physical science research in Antarctica: New Zealand and Auckland perspectives**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.13-18, 12 refs.

In this paper the physical sciences are taken to include the atmospheric and terrestrial sciences such as meteorology, ionospheric physics, atmospheric and aqueous chemistry and physical oceanography. A review of the last 20 years of physical science research conducted under the auspices of the N.Z. Antarctic Research Program shows an early dominance by atmospheric studies in ionospheric physics and geomagnetism, reflecting the residual emphasis of research programs initiated during the International Geophysical Year. A subsequent emphasis on meteorological research was not sustained, since ionospheric physics was again dominant in the early 1980s. However, the late 1980s witnessed the emergence of studies in atmospheric chemistry, primarily as a consequence of Antarctica's suitability for baseline monitoring and the growing awareness of the extent and significance of global pollution. (Auth. mod.)

A-43464

De Poorter, M., Schmidt, S., **Greenpeace environmental and scientific programme in Antarctica**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.39-42, 10 refs.

Greenpeace to date has carried out environmental inspections at 39 antarctic stations. Waste disposal practices and implementation of other environmental regulations remain areas of concern. Findings from a sampling program include toxicologically significant organic compounds in effluents, high levels of PCBs in marine sediments, pesticide residues and other organochlorines in biological samples, and heavy metal contamination in soil. The science program includes collaborative projects with a number of scientists from different nations, contributing to research of global or unique antarctic relevance, and supplies information to international data bases. (Auth.)

A-43465

Hemmings, A.D., Hay, J.E., Towle, S.M., **Environmental science: coming of age in Antarctica**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.45-52, 22 refs.

Environmental science is a new undertaking in the antarctic context. It is a distinct discipline of planned research, not merely the sum of disparate physical, earth and biological science projects. The issues on the environmental research agenda are wide-ranging, from global climatic change, through modelling of the antarctic-wide environment to studies of human impact and its management. To date,

New Zealand's science priorities have not always reflected its broader national policy for Antarctica. This reflects, in part, the current limited structures for developing and reviewing antarctic science. Closing the gap between the overall national and science policies in Antarctica has implications for the future development of these structures. (Auth. mod.)

A-43466

Logan, H.F.M., **Tourism and other activities**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.53-54.

Fisheries and tourism, seen as comprising together a higher level of human activity than the present New Zealand antarctic research programs, are described, with the following concluding remarks: that science and environmental protection are the preferred uses of Antarctica, tourism is an acceptable use, and extractive activities like fisheries, mineral exploitation, military maneuvers and hazardous waste dumping should be restricted or prohibited uses.

A-43467

Harrowfield, D.L., **Conservation and management of historic sites in the Ross Dependency**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.55-66, Refs. p.65-66.

In the Ross Dependency there are 24 known historic sites of which 8 are recognized by the Antarctic Treaty. These sites have links with 6 expeditions between 1898-1917 and include wooden huts, rock shelters, supply depots, camp sites, memorials, a message post, and a grave. Most are located in coastal areas from Cape Adare to Ross I. By the mid 1970s emerging conservation problems were being recognized. These were largely climatic and marine-related. With snow entering buildings and artefacts deteriorating, a coordinated conservation program was called for. There was also an increasing human impact from visitors to the historic sites. To address these problems the Ross Dependency Research Committee established a Historic Sites Management Committee and adopted a 5 year corporate strategic management plan. The Committee also led to the formation of the Antarctic Heritage Trust in 1987. The Trust, with major support from DSIR Antarctic which is responsible for the overall management of the historic sites, has now completed three summer programs. (Auth. mod.)

A-43469

Wallace, C., **Developing a New Zealand antarctic policy**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.75-81, 23 refs.

This paper does not attempt to cover the whole spectrum of New Zealand antarctic policy: science policy, fisheries and a range of other matters are not surveyed here. In 1975 New Zealand's proposal to ban mining failed so she joined the other Treaty Nations in negotiating rules for mining. This initiative is no longer favored. Proposals for a ban on mining come in a range of structural forms and levels of certainty. Some options embody the ban into the core of a single environmental protection instrument. It is argued that such an embodiment makes the ban more certain and more achievable because it is part of a package of environmental protection for which there is strong moral and political pressure to adopt. ASOC favors the negotiation of a single environmental instrument which would embody a ban on minerals activity. Negotiations to this end should be conducted in a series of meetings within the Special Consultative Meeting framework rather than relying on negotiations within the standard Treaty meeting timetable. (Auth. mod.)

A-43474

Cooper, J., **Publications and theses on antarctic and sub-antarctic birds, 1989**, *Marine ornithology*, Dec. 1990 18(1/2), p.19-25, 2 refs.

102 scientific publications and theses on antarctic and subantarctic birds for the year 1989 are listed by title. This annual list is produced by the Bird Biology Subcommittee of the Scientific Committee on Antarctic Research (SCAR) Working Group on Biology as a service to marine ornithologists. (Auth.)

A-43479

Scientific Committee on Antarctic Research, Working Group on Biology, Bird Biology Subcommittee, **Minutes of meetings, 16-18 July 1990, São Paulo, Brazil**, *Marine ornithology*, Dec. 1990 18(1/2), p.79-89.

The Subcommittee ranged over a broad band of territory in the southern ocean while considering reports on a wide variety of bird topics which included banding, publications, sea bird populations/distributions, giant petrels, CCAMLR ecosystem monitoring program (CEMP), plastics pollution, incidental mortality of birds, SIBEX sea bird data, antarctic sea bird research, pollutants, and concern about human over-population on King George Island.

A-43488

Australia. Antarctic Division, **Antarctic Treaty particulars for the Australian National Antarctic Research Expeditions (ANARE): exchange information under Article VII(5) for 1990-91. Modifications of activities previously reported under Article VII(5) for 1989-90**, 1990, 117p.

Seventeen items are included as exchange information, ranging from details on expeditions and transport to and from Antarctica, through stations and camps, personnel details, small arms, scientific programs and equipment, emergency assistance facilities, unoccupied refuges, species killed or captured, scientific use of radio-isotopes and rockets, oceanographic research programs, tourist activities and waste disposal. Nine modifications are made for 1989-90 in the following areas: expeditions, transport and personnel details; scientific programs; transportation facilities and communication equipment; species killed or captured; use of radio-isotopes; oceanographic research; and tourist activities.

A-43489

Australia. Antarctic Division, **1989-90 Australian Antarctic Research Program. Initial summary research activity**, Kingston, Tasmania, 1990, 152p.

Brief summaries are provided of research conducted during the 1988 winter and 1989-90 summer by ANARE in chemistry, earth sciences, logistics, environmental studies, glaciology, history, human biology and medicine, life sciences, mapping, meteorology, oceanography, physics, and political sciences. Each summary shows, with variations, title, principal investigator with affiliation, location of research site, project description, aim of research, field work carried out, difficulties encountered, significance of findings, planned dissemination of results, and collections acquired. Following the summaries are two appendices: an index by author, and names and addresses of principal investigators.

A-43507

Coles, P., **French research threatened**, *Nature*, Feb. 14, 1991 349(6310), p.553.

French research programs scheduled for implementation at Dumont d'Urville in the 1991-1992 season could be entirely cancelled. This results from a draw-back of funding by the ministry for overseas departments and territories which has joint responsibility for the

French presence in Antarctica. Partly this situation reflects the increase in fuel costs due to the Persian Gulf crisis, and partly it represents a change in thinking of the overseas territories ministry. Specific consequences to the French antarctic program are outlined.

A-43533

British Antarctic Survey, **Proposed construction of a crushed rock airstrip at Rothera Point, Adelaide Island, British Antarctic Territory. Final comprehensive environmental evaluation**, Swindon, Natural Environment Research Council, 1989, 56p.

This evaluation considers a proposal to replace the existing ice skiway, situated 5 km from Rothera Station, with a crushed rock airstrip immediately adjacent to the station and the present discharging point for supply ships. The document is in two parts. The first part consists of a description of proposed activities, their alternatives, and present environmental state; the direct and second order environmental effects; and mitigation measures and monitoring. The second part consists of a Decision Document in which the impacts are evaluated in relation to the advantages of constructing, and the disadvantages of not constructing, the airstrip. The Natural Environment Research Council concludes that the scientific advantages to be gained by the construction and operation of the airstrip do justify the local and limited environmental impacts it will cause.

A-43552

Australia. Antarctic Division, **1990-91 Australian Antarctic Research Program. Antarctic Treaty exchange information: Supplement A to particulars for Australian National Antarctic Research Expeditions**, Kingston, Tasmania, 1990, 262p., Refs. passim. For selected papers see B-43553 through B-43557 and I-43558.

Described are research projects proposed to be conducted by ANARE during the summer of 1990-91 and winter 1991, in archaeology, chemistry, earth sciences, logistics, glaciology, environmental studies, history, human biology, life sciences, mapping, meteorology, oceanography, physics, political science and psychology. Included are indexes by author and by area, an ASAC Grant scheme and a list of names and addresses of principal investigators.

A-43583

Dumas, R., **Antarctic in world politics**, *International challenges*, 1990 10(1), p.4-8.

The problems that the adoption of the Antarctic Treaty solved, as well as the shortcomings that have appeared with the changes taking place in the Treaty's 30-year existence, are briefly reviewed. The increasing concern by the international community for the protection of the antarctic environment, primarily because of its role as a planetary indicator of change and an ecological reserve, is pointed out. The reasons for the French and Australian proposal for a global convention in 1990 to settle the environmental protection issue are presented.

A-43584

Orrego Vicuña, F., **Implementation of CCAMLR: is the decision-making machinery conducive to good management**, *International challenges*, 1990 10(1), p.9-12.

In assessing the effectiveness of the decision making machinery for the implementation of CCAMLR, the voting procedures, the role of the organs, institutional relations and the attitude of the parties are outlined. It is concluded that CCAMLR has in fact been laying the ground for making possible a realistic implementation of the ecosystem approach, which in itself is a measure of success in spite of the many shortcomings that can be identified.

A-43585

Heap, J.A., **Has CCAMLR worked? Management policies and ecological needs, *International challenges***, 1990 10(1), p.13-16.

A brief review of how important personalities have been in the development of the Antarctic Treaty System, of which CCAMLR is part, is presented, with special reference to the activities and writings of Dr. Brian Roberts who served as head of the Polar Region Section in the British Foreign Office for 32 years. Details are presented of the Convention for the Conservation of Antarctic Seals, and the idea of incorporating it and CCAMLR into one instrument is considered. It is concluded that, taking Dr. Roberts' objective for CCAMLR—prevention of a krill industry which would boom and crash as did the whaling industry—the answer to the title question: has CCAMLR worked, can be that, so far, it has.

A-43586

Beddington, J.R., Basson, M., Gulland, J.A., **Practical implications of the eco-system approach in CCAMLR, *International challenges***, 1990 10(1), p.17-20.

The basic principles of conservation, set out in article 2 of CCAMLR, are cited, and the difficulties in applying this Article in practice are discussed. Two of the main problems are identified: the scientific interpretation of the wording, and the fact that different interpretations may not be equally acceptable to the various parties of the Convention. In discussing the interaction between krill and its predators, it is pointed out that it has been difficult to gain a consensus for the need for stock conservation measures. The ecosystem approach to management implies new data and information needs, as well as new fisheries regulations; cooperation between the management body and the fisheries is suggested.

A-43587

Andersen, R.T., **Negotiating a new regime: how CRAMRA came into existence, *International challenges***, 1990 10(1), p.21-23.

A paper to be delivered as a contribution to a debate on CRAMRA as a Management Tool is outlined. Its two main parts consist of the analysis of underlying reasons for a minerals regime, with emphasis on political, environmental, and practical considerations; and in reviewing the negotiating history, including the common interests of seven claimant countries. In conclusion, the paper discusses the alternatives to the Minerals Convention.

A-43588

Brown, A.D., **Design of CRAMRA: how appropriate for the protection of the environment, *International challenges***, 1990 10(1), p.24-26.

It is suggested that CRAMRA is not seen as adequate to protect the antarctic environment in general, since it was only devised as a means for the Treaty System to respond to proposals to engage in minerals exploitation or other mineral activities. It is acknowledged that CRAMRA had many new and significant environmental features, notably the standards set in Article 4, but something more seems to be sought by members of the international community. Because of a concern that more is required to ensure effective protection of the environment, Australia's proposal that the effort of the Treaty parties should be concentrated on the development of a protection regime, preferably in the form of a Convention, is pointed out.

A-43589

Wolfrum, R., **Unfinished task: CRAMRA and the question of liability, *International challenges***, 1990 10(1), p.27-31.

Although CRAMRA establishes the basic rules governing responsibility and liability for damage to the antarctic environment resulting

from mineral resource activities, it is pointed out that these rules represent a framework only, and that they need further elaboration through a Separate Protocol. The complexity of the rules is discussed, and the Separate Protocol, which shall provide for further rules and procedures, is described.

A-43590

Kimball, L.A., **CRAMRA and other environmental regimes in the ATS: how well does CRAMRA fit, *International challenges***, 1990 10(1), p.32-37.

The title question—how well does CRAMRA fit with the other environmental regimes in the ATS—is considered both from an ends and a means perspective. The point is briefly made that it is safe to assume that there is no agreement on the ends in relation to antarctic minerals activities. The means, however, are discussed in detail, including the minerals issue, comprehensive environmental protection, and the pace-setting under CRAMRA for the evolution of the other legal regimes for governing antarctic activities.

A-43591

Scully, R.T., **Resource management and the changing profile of science in Antarctica: a growing pressure for relevance?, *International challenges***, 1990 10(1), p.38-42.

The concern for the need to harness the results of scientific research to better serve the management needs of the Antarctic Treaty System, which has emerged as one of the more important challenges facing the System, is the topic of this presentation. It is addressed from three perspectives: institutional requirements, data and information requirements for decision making, and the impact of management needs upon research programs. A number of possible responses are examined.

A-43592

Rinaldi, C., **SCAR in the ATS: conflict or harmony, *International challenges***, 1990 10(1), p.43-46.

Events leading to the signing of the Antarctic Treaty and the creation, and function, of SCAR—and the relationship between the two over the past 30 years—are reviewed. The harmonious cooperation within the System, both scientific and political, is pointed out.

A-43593

Joyner, C.C., **CRAMRA: the ugly duckling of the Antarctic Treaty System?, *International challenges***, 1990 10(1), p.47-51.

This paper examines the ugly duckling thesis as applied to the 1988 Wellington Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA). In mid-1990 the Wellington Convention has become the object of considerable international scorn and criticism both for what it does and does not purport to do. CRAMRA has in effect been branded the ugly duckling of the Antarctic Treaty System, criticized by many, loved by some and ignored by few. The main aim of this study is to weigh the political, legal and environmental benefits versus costs of putting the Wellington Treaty into force, with a view toward determining how this instrument might be permitted some day to evolve into a beautiful regulatory swan.

A-43594

Barnes, J.N., **Protection of the environment in Antarctica: are present regimes sufficient, *International challenges***, 1990 10(1), p.52-55.

The belief is expressed that negotiation of a comprehensive Antarctic Conservation Convention, which would establish the Antarctic as a wilderness and scientific reserve while creating the principles, procedures and institutions for evaluating and regulating activities, would fill a number of important gaps which remain open under CRAMRA.

A-43596

Jørgensen-Dahl, A., **Legitimacy of the ATS, *International challenges***, 1990 10(1), p.61-63.

The paper addresses the question of whether and in what sense an international society may be said to exist in which there are certain universally accepted norms of legitimacy. A challenge to the legitimacy of it from outside the Antarctic Treaty System (ATS) is presumably grounded on some alternative norms of legitimacy which enjoy a superior and more widely accepted status than those norms on which the ATS is based. From the consideration of international society, the paper moves to the identification and discussion of the rules, principles, or standards on which the ATS is based, with the conclusion that the legitimacy of the ATS cannot be based on a range of issues and considerations which all point to one final and conclusive answer. Developments in Antarctica itself are only part of the total picture. Perhaps as important is what happens elsewhere from which Antarctica cannot be isolated.

A-43597

Haron, M., **Ability of the Antarctic Treaty System to adapt to external challenges, *International challenges***, 1990 10(1), p.64-67.

For purposes of discussion, the external challenges to the Antarctic Treaty System (ATS) are grouped into three separate, although interlinked, categories: one related to organized political efforts at the UN among Non-Treaty Parties to interact with the Antarctic Treaty Parties; the second involving non-governmental organizations in issues of environmental and conservational nature; and the third, which is of global environmental and conservational concern that is not specific to Antarctica. The activities of each are summarized, with the conclusion that these challenges have had, and are likely to continue to have, a positive effect on the ATS and its continuing evolution.

A-43598

Harris, S., **Influence of the United Nations on the Antarctic System: a source of erosion or cohesion?, *International challenges***, 1990 10(1), p.68-72.

While in general the treaty parties have resisted any extension of UN involvement in Antarctica, they have obviously responded to the UN challenge. In doing so, for ATS members the UN challenge has been a cohesive rather than erosive force, and the ATS has almost certainly been the better for it. Some countries, however, who were previously internationalist have become less so. Thus while the ATS is more internationalist, the determination to resist the multilateral solution of the UN seems to have increased.

A-43601

Stokke, O.S., **Relevance of the ATS as a model for international cooperation, *International challenges***, 1990 10(1), p.81-84.

It is conventional wisdom that the ATS model is not very relevant to other cooperative processes in the world, because the conditions are so unique: the strategic relevance of Antarctica is fairly low, the immediate economic importance negligible, at least in the post-whaling era, and the scientific activity conducted here is mainly of a non-applied type and therefore only moderately competitive. The purpose of this article is to challenge this contention, and show that on closer inspection, the evolving ATS may provide some relevant lessons to international cooperation even in the conflict-fraught arctic regions.

A-43602

Messer, K., **Towards firmer institutionalization of the ATS? Future role of the Consultative Meeting and the issue of a permanent secretariat, *International challenges***, 1990 10(1), p.85-90.

The following is outlined: development of the ATS infrastructure thus far; the emergence of the issue of a permanent secretariat; expediency and justification of a secretariat, including arguments of supporters, arguments of the opponents, and elements of a synthesis; the significance of a secretariat for the future role of Consultative Meetings, including strengthening the regulatory and decision-making powers of Consultative Meetings, and consequences for consultative rounds being inadequately or unevenly prepared; and alternatives for a transitional period, including substitutes for a common secretariat, procedural arrangements for improving the efficiency of the ATS, and procedural matters concerning responsibility for administrative reforms.

A-43614

Korea Ocean Research and Development Institute, **Report on the overwintering of the First Korea Antarctic Research Program**, Seoul, 1990, 313p., In Korean with English summary.

This report describes the life and activities of the overwintering party of the First Korea Antarctic Research Program at King Sejong Station from Feb. 1988 to Feb. 1989. A mean temperature of -1.9 C and mean wind speed of 7.3 m/s were observed during the winter. Minimum temperature of -19.9 C and maximum wind speed of 43.3 m/s were measured in late Aug. and late Dec. 1988, respectively. The ice cover at Maxwell Bay and Marian Cove showed a thickness of more than 60 cm from early July to late Sep. Field activities were hampered in June because of short days and frequent blizzards. Long separation from families and dull life in unfamiliar conditions, rather than harsh physical environments, were the major hardships for the wintering members. Other observations in the vicinity of the station include raised beaches and moraine deposits; a rookery of two species of penguins (Gentoo and Chinstrap); and several species of sea-birds breeding 2 km south of the station. *Deschampsia antarctica* is found in the southern area of Marian Cove, and several families of elephant seal inhabit the beach. (Auth. mod.)

A-43615

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari, Vol.5, No.5**, 1990, p.26-31, In Italian.

The only news item concerning Antarctica in this issue deals with the conclusion of a successful transantarctic expedition, July 27, 1989 to Mar. 3, 1990, at Mirnyy Station.

A-43616

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari, Vol.5, No.7-8**, 1990, p.39-44, In Italian.

The following news items concern Antarctica in this issue: the conservation issue and the Antarctic Treaty System; the effect of Antarctica on global climate; satellite monitoring of albatross flights through small transmitters attached to the birds; and international meetings of Friends of Antarctica.

A-43617

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari, Vol.5, No.10**, 1990, p.52-58, In Italian.

The following news items concern Antarctica in this issue: the outline of the 1990-1991 antarctic ski expedition by women from the United States, Japan, France, China and Australia; the outline of project SEARISE and the role of polar ice in climatic variability; highlights of Korean research in Antarctica; and the publication of the Korean Journal of Polar Research.

A-43618

Centro Ricerca e Documentazione polare, Rome, **Polar news/Notizie polari, Vol.5, No.9**, 1990, p.46-50, In Italian.

The following news items concern Antarctica in this issue: the effects of seal population growth on the vegetation of Signy I., the impact of the Bahía Paraíso oil spill; the British Antarctic Survey plans to replace the research vessel *John Biscoe* with a new one, the *James Clark Ross*, and to build a runway at Rothera Station; the description of a model of the Weddell Sea ice; and the 15th anniversary of the Italian Antarctic Expedition.

A-43619

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.5, No.11, 1990, p.59-65, In Italian.

The following news items concern Antarctica in this issue: the outline of the functions of a new French polar institution; a 1990-1991 projected 3200 km traverse by six Norwegians, following the route of Shackleton's 1914-1916 expedition from the Weddell to the Ross Sea; the biological effects of ozone depletion; the 1989-1990 Lambert Glacier traverse by a group of six scientists, departing from, and returning to, Mawson Station in 70 days; and a description of the GPS (Global Positioning System) utilization in antarctic research.

A-43626

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.5, No.12, 1990, p.66-71, In Italian.

The following news items concern Antarctica in this issue: an outline of the 1990-1991 New Zealand antarctic research program; a United States project to dispose of waste accumulated around McMurdo and Palmer Stations and to assess the need to remove materials left at East Base on the Antarctic Peninsula; satellite data on algae population on Kerguelen-Is.; and an update on the Australian 1989-1994 research program in the Prince Charles Mountains.

A-43628

Sovetskaia antarkticheskaia ekspeditsiia, Serdiukov, V.I., ed, Botnikov, V.N., ed, **Twenty-sixth Soviet Antarctic Expedition. Studies of the 1980-81 season** [Dvadsat'shestaia Sovetskaia antarkticheskaia ekspeditsiia. Sezonnye issledovaniia 1980/81 g.], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1988 Vol.83, 140p., In Russian. Refs. passim. For individual papers see B-43632, J-43629 through J-43631, J-43633 and J-43634.

This volume contains information on observations and results of scientific efforts carried out by the 26th Soviet Antarctic Expeditions in the 1980-1981 season on the antarctic continent and surrounding waters. Seasonal activities and organization of the expedition, ship-board research as well as geological, geophysical and glaciological observations carried out on the mainland, are outlined in the first part of this book. The second part consists of 6 individual papers giving the scientific results of projects in oceanography and marine biology.

A-43637

Kruger, W., **Geosciences research of the DDR in Antarctica** [Geowissenschaftliche Forschungen der DDR in der Antarktis], *Geographische Berichte*, 1989 132(3), p.169-182, In German. 9 refs.

The history of the East German experience in Antarctica since 1959 is reviewed. Much of the research undertaken during that period was a cooperative effort with the Soviet Union, and included joint occupancy of research bases and a commonality of purpose in the conduct of research programs. The programs covered the full range of disciplines on and under the land, on and below the ice and water surfaces, and in the air and space. A major segment of the overall program was the geological research of several years duration conducted in an area known to the Russians and East Germans as the Schirmacher Oasis.

A-43663

Gupta, R.S., **India's Antarctica adventure**, *India news*, Jan. 1-15, 1991 30(1), p.17-18.

A review is given of India's involvement in antarctic research from Dec. 1981 to the present, including the opening of 2 stations: the Dakshin Gangotri and, recently, the Maitree. Highlights are presented of research programs carried out in Earth and atmospheric sciences, marine and terrestrial biology, environment, oceanography, and human physiological and psychological changes due to extreme antarctic conditions. Activities of the Geological Survey of India (GSI) and the National Geophysical Research Institute (NGRI) mainly concern mapping, glaciological studies, and geological and geomagnetic surveys. The Indian Institute of Geomagnetism (IIG) is involved in a long term study of geomagnetism, with personnel wintering over. Routine meteorological data collection is conducted by the India Meteorological Department (IMD) and the National Physical Laboratory (NPL), which also carries out intensive studies on radio propagation in the upper atmosphere and on the ozone hole. The National Institute of Oceanography (NIO), and other government and private agencies, conduct research on the terrestrial and marine flora and fauna and environmental pollution. Coordinated future plans, resulting in allotment of specific programs to specific organizations, are summarized.

A-43691

Rakusa-Suszczewski, S., **Antarctica: mineral and living resources** [Antarktyka: zasoby mineralne i żywe], Wrocław, Zakład Narodowy imienia Ossolińskich, 1980, 100p., In Polish. 42 refs.

In this general work the author begins with an overview of Antarctica and the Southern Arctic Ocean, including Polish activities and the legal status of the continent. The next 2 chapters deal with mineral resources (hydrocarbons, minerals, geothermal energy) and living resources (crustaceans, krill, fish, seals, birds, cephalopods, algae, whales), and some perspectives on utilizing these marine resources. The final chapter deals with biological investigations by research stations in Antarctica. The author closes by emphasizing the importance of international participation and cooperation in directing and regulating the exploitation of the continent.

A-43732

ANARE Club, **Aurora**, Mar. 1991, Vol.10, No.3, Melbourne, 1991, 33p.

This issue contains articles concerning new programs for surveys and compilation of antarctic maps, not only Australian but international involvement as well; the availability of maps; a recollection of the last days on board the *Nella Dan*; a list of books on antarctic expeditions up to WWI, a collectors' item; an account of the international expedition to the Amery Ice Shelf in 1969-1970; and a tourist's impressions from her visit to Antarctica and the subantarctic islands; also correspondence, book reviews and miscellaneous news.

A-43733

ANARE Club, **Aurora**, Dec. 1990, Vol.10, No.2, Melbourne, 1990, 28p.

This issue contains articles concerning ships chartered by the Australian Antarctic Division; the last voyage of HMAS *Labuan*; the small huts on Macquarie I. and the research carried out there over the decades; a report on Australian antarctic construction expertise, including a sketch of components of a typical modular building and photographs of Casey's emergency power station; and the continuation of a diary from the Southern seismic journey, from Mawson, 1958. Also included are a book review, Division news, weather news, and ANARE Club news.

A-43734

ANARE Club, *Aurora*, Sep. 1990, Vol.10, No.1, Melbourne, 1990, 28p.

This issue contains articles concerning the ANARE Club's president and editor reports; the Club's financial statement for the year ending Apr. 1990; a radio documentary series on Australia's postwar activities in Antarctica; a continuation of a diary from the Southern seismic journey, from Mawson, 1958; a survey and excavation of historic sites on Macquarie I.; tourism in Antarctica; and the concluding article on "A history of the Antarctic Division Physics Section"; also miscellaneous news items, correspondence and ANARE Club news.

A-43739

Anderson, C., Coles, P., Ewing, T., Aldhous, P., Dickman, S., **Research in Antarctica: exploring the still unexplored**, *Nature*, Mar. 28, 1991 350(6316), p.287-308.

An overview provides some insight into a few of the major problems affecting antarctic research and reminds us that there are cogent, powerful arguments on both ends of the spectra of differences: antarctic construction vs. protection of the environment; concentration of effort in more easily accessible areas of the continent vs. larger sampling areas for more significant comparison of results; better coordination of research programs vs. unfettered individualistic programs. The pages that follow are accounts of visits to Antarctica by representatives of the United States, France, Australia, Great Britain, and Germany. They are vignettes of programs in progress by scientists from those nations, why such programs are going on, of equipment being updated, and stations being revamped or expanded.

A-43755

Australia. Antarctic Division, **ANARE news**, No.63, Kingston, Tasmania, 1990, 31p.

This issue includes, among others, items dealing with new techniques and instrumentation for mapping of the Antarctic; past achievements and future plans of field and marine programs, including environmental research and protection; management, transportation and communication operations; Australian legislation to prohibit mining in Antarctica; people, publications and weather summaries for May-July, 1990, at Mawson, Davis, Casey and Macquarie I.

A-43805

Bhattacharya, B.B., **Need for geophysical investigations in Antarctica**, Association of Exploration Geophysicists. Convention, 12th, Trivandrum, India, Centre for Earth Science Studies, 1986, p.73-81, 24 refs.

DLC TN269.A842

An assessment of antarctic mineral resources at the present stage is made, based on geological analogies and reconnaissance evidence. It is suggested that the exploitation of potential resources in Antarctica will depend on further exploration, with large scale geophysical survey activities. The exploitation of any particular mineral deposit in Antarctica will depend on its type, size and location, as well as a combination of environmental factors and the availability of supplies from elsewhere. The minerals of high value or strategic importance, such as diamonds, gold, platinum, nickel etc., are of more interest than coal or iron, which are widely available at low cost. The quality and quantity of deposit is important because it will decide the "returns ratio". Other problems to be overcome for exploration and exploitation in Antarctica are the political questions of sovereignty, resource control, and environmental protection.

A-43816

Scientific Committee on Antarctic Research, **SCAR report No.6**, Jan. 1991, Cambridge, Scott Polar Research Institute, 21p.

The report contains the following: Recommendation XV-1 from the 15th Antarctic Treaty Consultative Meeting held in Paris, Oct. 19-20, 1989, concerning comprehensive measures for the protection of the antarctic environment and dependent and associated ecosystems, in response to which the XIth Antarctic Treaty Special Consultative Meeting (ATSCM), held in Viña del Mar, Chile, Nov. 19-Dec. 6, 1990, was convened; a report on the ATSCM by a SCAR observer, summarizing proceedings and issues under discussion, and highlighting the contents of papers presented by various Working groups which were set up to examine specific issues; and the final product of the meeting, the Interim Report of the ATSCM, which outlines the meeting and refers to a paper, supplemented by the annexes developed by Working Group II, as "a valuable basis for further work" when the meeting is resumed in Madrid in Apr., 1991. Included is a presentation by the President of SCAR, informing the delegations of the vital importance of antarctic science, not only for its regional sake, but also for its implications for the rest of the world.

A-43824

Kimball, L.A., **Southern exposure: deciding Antarctica's future**, Washington, D.C., World Resources Institute, 1990, 39p.

In a series of short essays a profile is drawn of Antarctica showing its recognition as a storehouse of climates and geologic formations from the Gondwana age through the drifting apart of the continents to the current problems of the ozone depletion, the debate over the search for minerals, and the krill-to-whale food chain. This is followed by a review of the development of the Antarctic Treaty and its corollaries on the protection of seals and other marine living resources. The main thrust which binds all into one is the emphasis placed on the protection of a very fragile environment. To gain the needed protection, the vital importance of Antarctica and its environment to the protection of the rest of the world is emphasized, and unhindered international cooperation is identified as the most powerful tool needed to establish what is a modern day statement of enlightened self-interest.

A-43833

Cassidy, W.A., ed, Whillans, I.M., ed, **Workshop on antarctic meteorite stranding surfaces**, *Lunar and Planetary Institute. Technical report*, 1990 LPI TR90-3, 103p., Refs. passim.

The workshop recognized three prime functions of meteorite stranding surfaces. They provide: a proxy record of climatic changes; a proxy record of ice volume change; and a source of unique nonterrestrial material. The workshop focused on the first two, with presentations by meteoritists, glaciologists, geologists, meteorologists, and geophysicists. Agreement was unanimous that the potential exists in meteorite stranding surfaces for clear proxy records of climate and ice change. Specific recommendations, written by three different authors to convey the views of the group, are included as separate sections of this report. They are *Deducing Past Climate* by G. Crozaz, *Origin of Stranding Surfaces* by G. Faure, and *Strategies for the Future* by M. Lipschutz. These are followed by abstracts of the papers presented at the Workshop.

A-43839

Lamendola, F., **Naturalist Carl Skottsberg's exploration of the extreme South** [Carl Skottsberg, un naturalista alla scoperta dell'estremo sud], *Il Polo*, Sep. 1988 Vol.3, p.11-17, In Italian. 13 refs.

A review is presented of the travels of the botanist Carl Skottsberg, a member of various Swedish expeditions, including the 1901-1903 expedition to the subantarctic islands and the Antarctic Peninsula, where he studied marine algae and fossil plants.

A-43853

Pendleton, S., **Living in an icebox: polar bases on stamps**, *Scott stamp monthly*, Mar. 1991 9(5), p.21-22.

The essay reviews and shows some of the stamp issues depicting antarctic national bases. Stamp replicas included are Alfred Faure (Crozet, France), Vostok (USSR), Almirante Brown (Argentina), General Artigas (Uruguay), Cape Evans Hut (UK), Esperanza (Argentina), Georg Forster (Germany), Teniente Matienzo (Argentina), Teniente Marsh (Chile). The United States has not issued a stamp depicting any of its bases.

A-43854

Manthey, M., Oehlenschläger, J., Rehbein, H., **Keeping quality and shelf life of frozen stored battered and unbattered portions cut from fillet blocks of antarctic fish**, *International journal of refrigeration*, Jan. 1991 14(1), p.58-64, With French summary. 25 refs.

Standard fish fillet blocks prepared from five antarctic fish species (*notothenia rossii marmorata*, *N. kempfi*, *N. gibberifrons*, *Dissostichus eleginoides*, *Chaenocephalus aceratus*) were tested for their suitability for processing into frozen portions (battered/unbattered) prepared from standard fish fillet blocks. Portions (100 g), coated and uncoated, were sealed separately in plastic pouches and stored at -28 C for up to 3 years. Their frozen storage behavior was investigated by chemical and sensory methods. The amount of water soluble protein, formaldehyde, dimethylamine and pH value did not change, whereas the total volatile base nitrogen increased slightly. Thiobarbituric acid number was species-specific and changed throughout the study. Isoelectric focusing allowed a differentiation between species independent of frozen storage time. Sensory results obtained for *D. eleginoides* and *Ch. aceratus* confirmed the high quality of the raw material and the suitability for long term storage. The judgement for *N. kempfi* indicated that this species was less suitable for the production of portions. Fillet samples were analyzed for their proximate chemical composition and mineral content at the beginning of the experiment. (Auth.)

A-43884

Bernini Vanni, P., **Research vessel in antarctic waters** [Una nave oceanografica nelle acque antartiche], *Rivista marittima*, Oct. 1990 Vol.123, p.87-97, In Italian.

The 5th Italian Antarctic Expedition, carried out on board the icebreaker *Cariboo* and at the Terra Nova Bay Station during the summer of 1989-1990, is discussed. Results of research conducted in various disciplines, including oceanography, terrestrial and atmospheric physics, geophysics, medicine, environment and biology, are summarized, and the instruments used, including the oceanographic BIONESS system, are described. Also provided is a plan of the ship, and a discussion on the ship's equipment and on some hazards of navigation in the Antarctic.

A-43892

Klokov, V.D., **Season activities of the 32nd Soviet Antarctic Expedition** [Sezonnye raboty tridtsat' vtoroi Sovetskoi antarkticheskoi ekspeditsii], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.5-9, In Russian.

Multi-discipline operations of the 32nd Soviet Antarctic Expedition, carried out in the summer of 1986-1987 by 694 participants on 9 ships, 12 flying units and at Soviet stations, are summarized.

A-43920

Sato, N., **Activities of the summer party of the 29th Japanese Antarctic Research Expedition in 1987-1988**, *Antarctic record*, Nov. 1990 34(3), p.381-393, In Japanese with English summary. 3 refs.

The summer activities of JARE-29, 1987-1988, are outlined. The icebreaker *Shirase*, carrying 52 expedition members, 5 Japanese observers and 2 Chinese scientists, and with a cargo of about 900 t, reached Showa Station on Jan. 2, 1988. The transportation of 730 t of cargo by means of helicopter and surface was completed by Jan. 12. The following scientific activities were carried out during the summer operation of JARE-29: aerial photographic survey for geological, geomorphological, and geodetic observations in the Sör Rondane Mountains region; geological, geomorphological, and biological surveys in the Riiser-Larsen Mountains region; biological and oceanographic observations and gravity measurements in the Showa Station area; seafloor geomagnetic observations in Breid Bay; and meteorological, oceanographic and ionospheric observations and sea gravity measurements on board the *Shirase*. (Auth. mod.)

A-43922

Takeuchi, S., **Activities of the summer party of the 30th Japanese Antarctic Research Expedition in 1988-1989**, *Antarctic record*, Nov. 1990 34(3), p.430-444, In Japanese with English summary.

Summer activities of JARE-30, 1988-1989, are outlined. The icebreaker *Shirase*—carrying 54 expedition members, 2 Japanese observers, one Norwegian and 2 Chinese scientists—with a cargo of about 1000 t., reached Showa Station on Dec. 29, 1988. The activities included unloading operations, field research, and construction and renewal of the station's facilities. A satellite data receiving system was completed. A rescue operation involving 3 members of JARE-29, who had fallen into a crevasse during research in the Sör Rondane Mountains, is discussed.

A-43923

Osanai, Y., **Report of geological, geodetic and biological fieldwork in the Sör Rondane Mountains, 1989-1990 (JARE-31)**, *Antarctic record*, Nov. 1990 34(3), p.445-481, In Japanese with English summary. 9 refs.

Members of JARE-31 carried out geological, biological and geodetic fieldwork in the whole area of the Sör Rondane Mountains, from Dec. 25, 1989 to Jan. 31, 1990. This fieldwork was conducted with the support of helicopter flights which were operated by the expedition members of JARE for the first time. The details of the operation plans, and a summary of the fieldwork including logistics and weather report, are presented. The results of geological, biological and geodetic investigations will be described in separate papers. (Auth.)

A-43950

Dey, A., **India in Antarctica: perspectives, programmes and achievements**, *Polar record*, Apr. 1991 27(161), p.87-92, 17 refs.

India's interest in Antarctica dates from 1956, when the Indian government first raised the question of the peaceful use of Antarctica in the UN. Although India began as a strong critic of the Antarctic Treaty System, and indeed conducted scientific activities on the continent for two years without being a member of it, India recognized that her interests would be better served by joining the Treaty as a full member. (Auth.)

A-43952

Manzoni, M., Zucchelli, M., **Italian engagement in Antarctica**, *Polar record*, Apr. 1991 27(161), p.121-124, 6 refs.

Following Italy's accession to the Antarctic Treaty in 1981, the Italian Parliament made provision for a six-year program of antarctic research, to be administered by the Ministry for University and Scientific and Technical Research. The program, Progetto Antartide, centers on a permanent scientific station at Gerlache Inlet, installed in 1986-87 for a staff of up to 60. Chartered ships, helicopters, snow

vehicles and heavy transport aircraft provide logistic support for a substantial scientific and field program, ranging widely from the base, the scope and extent of which are likely to increase. (Auth.)

A-43954

Stonehouse, B., **New research ship for British Antarctic Survey**, *Polar record*, Apr. 1991 27(161), p.134.

The RRS *James Clark Ross*, a multirole ship capable of safe operation in polar waters and replacing RRS *John Biscoe*, was launched on Dec. 2, 1990. A plan of the ship is provided, and details of its dimensions, facilities and equipment are discussed. The ship is expected to service the five BAS stations in Antarctica, and undertake a variety of marine science programs in antarctic waters.

A-43964

Scientific Committee on Antarctic Research, **Twenty-first Meeting of SCAR, 23 to 27 July 1990, São Paulo, Brazil**, *SCAR bulletin*, Apr. 1991 No.101, 19p.

This issue contains reports presented at the 21st SCAR meeting held in São Paulo, Brazil, July 23-27, 1990, by the following groups: the SCAR Subsidiary Groups, and COMNAP and SCALOP; and the group planning the structure and program of the Antarctic Science—Global Concerns conference, to be held in Bremen, Germany, Sep. 23-28, 1991. An overview of the Steering Committee progress, identifying 6 core programs for an Antarctic Global Change Programme, and an outline of SCAR strategy and functions, follow. Summary reports to XXI SCAR include the Finance Committee report, and reports with recommendations by the SCAR Working Groups in atmospheric sciences, biology, geology, solid-Earth geophysics, human biology and medicine, space related human factors, and glaciology.

A-43973

Thomson, M.R.A., ed, Crame, J.A., ed, Thomson, J.W., ed, **Geological evolution of Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings, Cambridge, University Press, 1991, 722p.

A brief summary of scientific research in Antarctica is given, emphasizing the rapidity of its development in the last decade. It is pointed out that most of the exposed rock on the continent has been explored, at least at the reconnaissance level, but most recently the need for a sharper focus for geological research has been recognized. With this in mind, convenors sought a symposium theme which would provide such a focus, while at the same time would not deter researchers whose interests lay in somewhat different directions or who were just beginning their programs. From discussions on this aspect two themes evolved: the structure and evolution of the antarctic lithosphere and the evolution of Cenozoic palaeoenvironments of the southern high latitudes. The Symposium attracted nearly 200 participants from 19 countries, and produced 138 papers presented orally and 34 poster sessions. 115 of the papers are included in this volume.

A-44047

Australia. Antarctic Division, **ANARE news**, No.65, Kingston, Tasmania, 1991, 20p.

Among the news items noted in this issue are: summer studies of Lambert Basin, including an outline of the Lambert Glacier program; geology of the Prince Charles Mountains; an outline of a geodetic program to improve survey control; biology studies of the mountains and in Prydz Bay, including a description of Voyage 6, 1990-1991, a marine science program; an ocean sound experiment, testing the greenhouse effect; operations at the 4 Australian stations; and recent publications and weather summaries for Nov.-Dec., 1990, and Jan. 1991, at Mawson, Casey, Davis and Macquarie I.

A-44066

Auburn, F., **Convention on the Regulation of Antarctic Mineral Resource Activities**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.259-271, 23 refs.

In June 1988, the Special Consultative Meeting on Antarctic Mineral Resources concluded more than 5 years of negotiations between the Consultative Parties to the Antarctic Treaty with agreement on the text of the Convention on the Regulation of Antarctic Mineral Resource Activities. The Convention provides an exclusive framework for the regulation of prospecting and the licensing of exploration and development in the area south of 60S. Licences can only be obtained by States Parties to the Convention or by Operators sponsored by such States. An outline is provided of the Convention, the negotiations, the Advisory Committee, and activities, including prospecting, exploration and development.

A-44067

Kimball, L.A., **Special report on the Antarctic Minerals Convention**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.273-310, 24 refs.

On June 2, 1988, the Convention on the Regulation of Antarctic Mineral Resource Activities was adopted by consensus in Wellington, New Zealand. This report provides a description of the Convention; answers to some key questions, such as when could minerals development commence in Antarctica, for example; a commentary on how the treaty deals with ownership of Antarctica claims, the concerns of developing nations and environmental concerns; implementation considerations; and additional reading suggestions.

A-44073

Basberg, B.L., Naevestad, D., **Industrial archaeology at South Georgia**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.21-26, 5 refs.

*During NARE 1989/90, a survey was made of the condition of the structures and their contents on South Georgia. They all have badly deteriorated due to a very long period of neglect. The general conclusion is that while some of the heavy machinery and larger artifacts can be salvaged, most of the standing remains should be left to deteriorate. Of all locations on the island, it is recommended that the major restorative effort, if any, be concentrated at Grytviken.

A-44158

Kunzig, R., **Earth on ice**, *Discover*, Apr. 1991 12(4), p.55-61.

This is a brief thumb-nail sketch of John Martin, the oceanographer who recently startled the scientific world by offering a simplistic solution to the problem of global warming because of too much atmospheric CO₂. His idea is to speed up the natural CO₂ consumption process by broadcasting about 300,000 tons of iron into the waters around Antarctica. This addition would cause the phytoplankton to bloom and, in turn, enable them to convert all the available nutrients, including CO₂, which enter the sea from the atmosphere, into new organic matter. What comes through in this sketch is that Martin is a down to earth individual who does not allow creative and practical thinking to be a hostage to formal scientific methods and practices. This has not always set well with other scientists, who point out flaws in his arguments and remain unconvinced that his theory will prove true.

A-44164

Wharton, R., Roberts, B., Chiang, E., Lynch, J., Roberts, C., Buoni, C., Andersen, D., **Use of analogs to support the Space Exploration Initiative**, Washington, D.C., U.S. National Aeronautics and Space Administration/U.S. National Science Foundation, 1990, 19p.

This report discusses the Space Exploration Initiative and the U.S. Antarctic Program in the context of assessing the potential rationale and strategy for conducting a cooperative NASA/NSF effort. Specifically, such an effort would address shared research and data on living and conducting scientific research in isolated, confined, hostile, and remote environments. A review of the respective goals and requirements of NASA and the NSF indicates that numerous opportunities exist to mutually benefit from sharing relevant technologies, data, and systems. Two major conclusions are drawn: the transfer and application of critical technologies (e.g., power, waste management, life support) and collaboration on crew research needs (e.g., human behavior and medical support needs) would streamline USAP operations and provide the scientific community with advancements in facilities and tools for antarctic research; and Antarctica is one of the few ground-based analogs that would permit comprehensive and integrated studies of three areas deemed critical to productive and safe operations on the Moon and Mars: human health and productivity; innovative scientific research techniques; and reliable, efficient technologies and facilities.

A-44167

Stewart, J., **Antarctica: an encyclopedia**, Jefferson, North Carolina, McFarland and Company, Inc., 1990, 2 vols.

DLC G855.S74 1990

These volumes comprise "an A-to-Z of Antarctica, incorporating geographical features, expeditions, people, scientific subjects, and entries of general interest, anything useful to the average reader as well as the specialist." Appendices carry these sections: chronology, a listing of significant events showing the date, person, and ship (if any), extending from Apr. 7, 1502 through Mar. 3, 1990; a listing of expeditions by date, leader, and vessel from 650 through 1989-90; and a bibliography. The preponderance of main entries are geographical and they parallel those of *Geographic Names of Antarctica*, F.G. Alberts, editor (1981), which is now out of print. A sample of the diversity of entries other than those of a geographical nature could include: Expeditions, by name; stamps; explorers/discoverers, by name; nuclear power; recreation; operation; Snowcruiser; international cooperation; Antarctic Treaty; and Society Expedition Cruises, Inc. and Mountain Travel (commercial tour agencies).

A-44168

[U.S. National Science Foundation], **Gazetteer of the Antarctic. Fourth edition**, Washington, D.C., 1989, 145p., For earlier antarctic gazetteers see 12A-24692 and 13A-27794.

The gazetteer contains names of features in Antarctica and the area extending northward to the Antarctic Convergence that have been approved by the U.S. Board on Geographic Names as recently as mid-1989. It supersedes previous Board gazetteers for the area. For each geographic feature, the book contains the name, cross references if any, and latitude and longitude. Coverage corresponds to that of maps at the scale of 1:250,000 or larger for islands, coastal Antarctica, and mountains and ranges of the continent. Much of the interior of Antarctica, an ice plateau, has been mapped at a smaller scale and is nearly devoid of features and toponyms. All of the names are for natural features; scientific stations are not listed. For the names of submarine features, reference should be made to the *Gazetteer of Undersea Features*, U.S. Board on Geographic Names (1981).

A-44199

Von Drygalski, E., **Southern ice continent: the German South Polar Expedition aboard the *Gauss*, 1901-1903**, Bluntisham, Cambridgeshire, Bluntisham Books; Alburgh, Harleston, Norfolk, Erskine Press, 1989, 373p., This copy has duplicate leaves for p.109/110 and 131/132 and pp.23-26 are missing. 28 refs.

DLC G850 1901.D48D7813 1989

This translation of Drygalski's report is organized chronologically in this manner: Ch 1-3, logistics, organization, expedition complement, the *Gauss*; Ch 4-6, at sea, Kiel to Capetown; Ch 7-9, the subantarctic islands, Crozet, Kerguelen, Heard; Ch 10-19, on the ice, biology, weather, tides and currents, beset, setting up and operating the station, sledging; Ch 20-23, Der Weg Zurtük via the Indian Ocean, St Helena, Ascension I., Kiel. What did the *Gauss* achieve? The twenty volumes of results of the German South Polar Expedition contain a mass of data, from which Meinardus deduced the existence of the Antarctic Convergence, and calculated the average elevation of the continent at about 2500 meters, from his estimate of the extent of atmospheric exchange between the antarctic and subantarctic regions. From the direction of the prevailing winds at the Winter Station Meinardus predicted the existence of a large bay in the vicinity, confirmed as the Mackenzie Sea (now Bay) when the *Discovery* entered it in Feb. 1931, and since demonstrated to be bounded by the Amery Ice Shelf. Fourteen of the volumes of results are filled with zoological, botanical and bacteriological data; 4030 species and varieties are described, of which 1440 are exclusive to the Antarctic. There was no high drama—no disasters, no wild successes: perhaps the long catalogue of minor mishaps looms all the larger for that. Either way, the public taste for the sensational went unsatisfied, and in spite of the mass of data and specimens brought back by the expedition it was, unfairly, condemned as a failure. A closer reading of Drygalski's account will show, in terms of courage, endurance, ingenuity and determination, as well as in its scientific aspects, that it was not.

A-44217

Andersen, P.H., **Astrophysics goes south**, *Science*, June 14, 1991 252(5012), p.1494-1495.

This review provides a sketch of atmospheric physics observational programs in progress in Antarctica and some possible avenues for future space research from there. Antarctica's high and dry summer atmosphere is an ideal environment for balloon-borne sensors for observing gamma and X-rays, supernovas and solar flares. In the planning stages are new telescopes designed to obtain clues on how galaxies, proto-galaxies and other large structures in the universe took shape. The programs are coordinated by the recently established Center for Astrophysical Research in Antarctica, a part of the Yerkes Laboratory at the University of Delaware.

A-44308

Soviet Committee on Antarctic Research, **USSR antarctic research report to SCAR No.32, 1990. Record of activities 1 April, 1989-31 March, 1990. Planned activities 1 April, 1990-31 March, 1991**, Moscow, 1991, 65p., In English with bibliography of Soviet antarctic literature for 1989 in Russian, p.53-65.

Outlines are presented of programs in progress and proposed at Soviet antarctic stations. Disciplines include atmospheric sciences, Earth sciences, geodesy and cartography, glaciology, biology, human biology and medicine, and logistics. Lists of responsible authorities and of principal investigators are included.

A-44309

ANARE Club, **Aurora, June 1991, Vol.10, No.4**, Melbourne, 1991, 32p.

This issue contains a paper on environmental management of Australia's antarctic program; an extract from a speech given in the

House of Representatives in favor of the Antarctic Mining Prohibition Bill; an article on the stages of investigation into the death of 7,000 penguins on Macquarie I., the probable cause and what action has been taken to avoid similar accidents in the future; the summary of a field evaluation of the Caterpillar Challenger 65 Tractor; an account of activities at Casey Station; a review of the 1988-1991 Lambert Glacier/Amery Ice Shelf study; a review of the history of the mapping of Prince Charles Mountains; and also correspondence, book reviews and miscellaneous news.

A-44310

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.6, No.1, 1991, 6p., In Italian.

The two news items dealing with Antarctica in this issue provide details of a project to build a new French station approximately 1,000 km from the Dumont d'Urville Station, and the description of a new Swedish icebreaker designed for polar expeditions.

A-44311

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.6, No.2, 1991, p.7-12, In Italian.

The following news items concern Antarctica in this issue: deep ice drilling at Law Dome by ANARE scientists; lidar studies of the upper atmosphere; ozone depletion studies during the 1990-1991 season; activities of USAP 1990-1991; the deployment of a new acoustic data system and instruments in krill fisheries; and mass deaths of penguins on Macquarie I.

A-44312

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.6, No.3, 1991, p.13-18, In Italian.

The following news items concern Antarctica in this issue: Australia to act on mining pollution in the light of the Antarctic Treaty; a study on the transmission of ultraviolet radiation in the Weddell Sea; the installation of a new meteorological center at Casey Station; the marking of Adélie penguins for satellite information on their activities during the non-breeding season; and the monitoring of seals and penguins around Elephant I. concerning their diet and behavior.

A-44315

Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca, **Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990** [Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990], Rome, 1990, 154p., Refs. passim. For individual papers see B-44322, E-44328, E-44334 through E-44336, F-44323, I-44331 through I-44333, I-44337, J-44316 through J-44321, J-44324 through J-44327, J-44329 and J-44330.

This volume is a collection of papers presented at a meeting held in Rome, Italy, June 8-9, 1990, reporting results of investigations into the pollution of sea and air in Terra Nova Bay. A definite pattern of significant data seems to emerge which, when examined together with biological, physical and geological data, could lead to a few preliminary conclusions of environmental relevance.

A-44348

Chang, S.K., **Historic sites and monuments in the Antarctic and Korea**, *Korean journal of polar research*, Dec. 1990 1(2), p.35-49, In Korean with English summary. 10 refs.

Potential sites and monuments which will symbolize Korean antarctic research are discussed. Two monuments on King George I., a plaque erected in Nov., 1985, and a monolith with 2 plaques erected in Feb., 1988 are already in existence. Possibilities for future monu-

ments include a plaque for research in the southern ocean and a statue of King Sejong decorated with an automatic water glass and an astronomical clock, both unique inventions of his reign. (Auth. mod.)

A-44397

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.6, No.4, 1991, p.19-24, In Italian.

The following news items concern Antarctica in this issue: the utilization of krill in the food industry; installation of a French station on Kerguelen Is. for data transmission via the INTELSAT; albatross survey by the Argos telemetric system on Crozet I.; the reconstruction of Halley Station; the construction of a runway in the vicinity of Rothera Station; a network of automatic weather stations and how they operate; and details on the construction of a new polar research ship, the *Nathaniel B. Palmer*, initiated by the U.S. National Science Foundation.

A-44398

Centro Ricerca e Documentazione Polare, Rome, **Polar news/Notizie polari**, Vol.6, No.5, 1991, p.25-31, In Italian.

The following news items concern Antarctica in this issue: French administrative difficulties in financing of current and future antarctic programs; an international project to study polar sea ice thickness under the auspices of WMO and ICSU; an Australian numerical model for studies of katabatic wind in the Lambert Glacier region; a long term monitoring project of antarctic icebergs and their exploitation potential; and the study of climate and sea ice variability in the southern ocean.

A-44413

Watanabe, O., **Activities of the wintering party at Syowa Station by the 29th Japanese Antarctic Research Expedition in 1988-1989**, *Antarctic record*, Mar. 1991 35(1), p.70-91, In Japanese with English summary. 6 refs.

The principal projects carried out by the 27 members of JARE-29 wintering over at Showa Station in 1988 to 1989 were as follows: development of an unmanned geophysical observatory; clouds and precipitation observation by means of vertical radar carried out as a part of the Antarctic Climate Research Program (ACR); biological investigation of antarctic terrestrial ecosystem, part of international Biological Investigations of Terrestrial Antarctic Systems (BITAS). (Auth. mod.)

A-44415

Osanai, Y., **Report on geological, biological and geodetic field survey in the Amundsen Bay region, 1990** (JARE-31), *Antarctic record*, Mar. 1991 35(1), p.118-128, In Japanese with English summary. 5 refs.

The ten-man summer field party of the 31st Japanese Antarctic Research Expedition carried out geological, biological and geodetic field work at Mt. Pardo and Tonagh I. in the southernmost part of the Amundsen Bay region. Also, from Feb. 12 to 19, 1990, four men on board an S-61 helicopter took aerophotographs of coastal areas around Casey and Amundsen Bays. This report describes the operation planning and summarizes the field operation and the results. (Auth. mod.)

A-44417

Harris, C.M., **Environmental effects of human activities on King George Island, South Shetland Islands, Antarctica**, *Polar record*, July 1991 27(162), p.193-204, Refs. p.203-204.

King George I., largest of the South Shetland Is., is the site of nine scientific stations of different nationalities operating within the Antarctic Treaty System. Following a recent visit by the author to assess environmental and management issues, this article (the first of

two) updates the status of developments on the island and outlines problems, real and potential, which have arisen from scientific activities, tourism, vehicles, use of fuels and waste disposal. It is concluded that existing management practices have not been adequate to deal with these problems and new approaches are required. (Auth.)

A-44424

Cruwys, L., **Seal skeletal material in the British Museum from antarctic expeditions**, *Polar record*, July 1991 27(162), p.262, 2 refs.

A table listing antarctic voyages up to 1937 that contributed pinniped material to the British Museum, with notes on material collected, is presented.

A-44516

Andersen, D.T., McKay, C.P., Wharton, R.A., Jr., Rummel, J.D., **Antarctic research outpost as a model for planetary exploration**, *British Interplanetary Society Journal*, 1990 Vol.43, p.499-504, 23 refs.

During the next 50 years, human civilization may well begin expanding into the solar system. This colonization of extraterrestrial bodies will most likely begin with the establishment of small research outposts on the Moon and/or Mars. In all probability these facilities, designed primarily for conducting exploration and basic science, will have international participation in their crews, logistical support and funding. High fidelity Earth-based simulations of planetary exploration could help prepare for these expensive and complex operations. Antarctica provides one possible venue for such a simulation. The hostile and remote dry valleys of southern Victoria Land offer a valid analog to the Martian environment, but are sufficiently accessible to allow routine logistical support and to assure the relative safety of their inhabitants. An antarctic research outpost designed as a planetary exploration simulation facility would have great potential as a testbed and training site for the operation of future Mars bases, and represents a near-term, relatively low-cost alternative to other precursor activities. Antarctica already enjoys an international dimension, an aspect that is more than symbolically appropriate to an international endeavor of unprecedented scientific and social significance—planetary exploration by humans. (Auth. mod.)

A-44681

Dugger, J.A., **Gas and oil prospects in Antarctica** [Una mirada hacia las perspectivas del petróleo y el gas en la Antártida], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.211-226, In Spanish. 66 refs.

DLC JX4084.A5A59

The possibilities of exploiting mineral resources in the Antarctic are discussed. Of particular interest are the hydrocarbon resources in the coastal and offshore regions. Technological, economic, environmental and exploration issues, such as commercial exploration, drilling, production, storage, transportation, pollution prevention and cleanup, are addressed. Potential impact on the environment is speculated upon and guidelines are offered.

A-44682

Pinochet de la Barra, O., **Antarctica in the 21st century. New political and legal perspectives** [Antártida en el Siglo XXI. Nuevas perspectivas políticas y jurídicas], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.227-242, In Spanish. 18 refs.

DLC JX4084.A5A59

An analysis is made of the rules and regulations to which countries that wish to obtain recognition of their sovereignty claims in

Antarctica will have to submit. It is pointed out that in spite of varied and conflicting territorial claims, the international accord and cooperation attained through the Antarctic Treaty stand as models of international behavior. Regarding future economic benefits from exploitation of mineral, especially hydrocarbon, resources, international cooperation is again emphasized as a prime factor for consideration in the establishment of a resource policy. In planning rational economic activities, a subdivision of the area into 4 regions—South American, Pacific, Australian and African—is recommended. Tourism is seen as another potential source of economic benefits in Antarctica.

A-44683

Puig, J.C., **"Argentine Antarctica and the Law": 25 years later** ["La Antártida argentina ante el Derecho": veinticinco años después], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.243-267, In Spanish. 25 refs.

DLC JX4084.A5A59

In setting the stage for understanding the present antarctic situation, an analogy is made between the evolution of the "antarctic question" and some novels by Alexander Dumas. The parallel is drawn between the plight of "The three musketeers" and several of the emerging issues which are straining the Antarctic Treaty: utilization of resources, territorial rivalries, the antarctic decision making process and, above all, the divisions within and between nations from opposing viewpoints on the related legal aspects. The latter are considered in detail, and some specific guidelines are offered, although it is predicted that frustrations and conflicts will continue in the future.

A-44688

Lyons, D., **Metal mining in polar regions**, International Offshore and Polar Engineering Conference, First, Edinburgh, United Kingdom, Aug. 11-16, 1991. Proceedings, Vol.2. Edited by M.S. Triantafyllou et al, Golden, CO, International Society of Offshore and Polar Engineers, 1991, p.574-581, 56 refs.

Mining has been prominent on the antarctic agenda for two decades. The Antarctic Treaty Nations have recently moved away from plans to regulate mining, towards a legal prohibition. Over the same decades metal mines have been developed in the Arctic. The long term effectiveness of controls on mining in Antarctica may depend on the absence of any real pressure to mine. In this paper, the development and operation of metal mining projects in the Arctic are reviewed, and a preliminary assessment is made of some of the technological and operational factors influencing the feasibility of similar ventures in the Antarctic. (Auth. mod.)

A-44692

Vallesi, A., **Legal regime of Antarctica in international law** [Il regime giuridico dell'Antartide nel diritto internazionale], *Il polo*, Mar. 1990 Vol.1, p.25-31, In Italian. 16 refs.

A brief historic profile of the early exploration of Antarctica and of the early sovereignty claims based on discovery and exploration is presented. The scientific activities of various countries, carried out in the 20th century on the continent as well as in the Subantarctic, and the repercussions of such activities in the international politico-legal realm, are discussed.

A-44693

Vallesi, A., **Legal regime of Antarctica** [Il regime giuridico dell'Antartide], *Il polo*, Sep.-Dec. 1989 Vol.3, p.59-67, In Italian. 10 refs.

In the introductory chapter presented in this issue, the geographic characteristics and climate of Antarctica, its potential mineral and living resources, and the geographic boundaries to the applicability of juridical restraints in Antarctica as described in Article VI of the Antarctic Treaty, are reviewed.

A-44706

Rakusa-Suszczewski, S., Kwarecki, K., **Antarctica—nature and man** [Antarktyka—przyroda i człowiek], Wrocław, Zakład Narodowy imienia Ossolińskich, 1987, 152p., In Polish. 12 refs.

The 1st section of this book is devoted to the natural environment and human activity, including sea ice, ocean currents, faunal adaptation, the H. Arctowski Station, politics and scientific activities, and environmental protection. The 2nd section deals with the adaptation and health of man in polar regions. An appendix to the 1st section includes a list of sites of special scientific interest, and the text of the Convention on the Conservation of Living Marine Resources of Antarctica.

A-44717

Cross, M., **Antarctica: exploration or exploitation**, *New scientist*, June 22, 1991 130(1774), p.29-32.

This brief report of Greenpeace's inspection of several antarctic stations in Mar. and Apr. 1991 focuses on the main themes of the need for cleaning up accumulated litter/garbage/trash and other debris normally accompanying human incursions anywhere, and the corollary need for insuring proper disposal of future droppings. The superabundance of "scientific stations" on King George I. is decried, the thinly disguised ploys for enhancing territorial claims, especially on the Antarctic Peninsula, are derided, and those "science programs" which serve no purpose other than to enable a nation to qualify as a Consultative Party, are debunked.

A-44763

Kusunoki, E., ed, **Science in Antarctica, Vol.1: Introduction** [Nankyoku no kagaku, 1: Sosetsu], Tokyo, National Institute of Polar Research, 1991, 295p., In Japanese. Refs. p.279-290.

This is Vol.1, but the last published, of a series of nine volumes on science in Antarctica. The other eight volumes, published from 1982 to 1989, are on the aurora and upper atmosphere, meteorology, ice and snow, earth sciences, meteorites, biology, oceanography, and data compilation. This volume, titled "Introduction," both introduces and summarizes the entire series. Topics include geology, solid earth physics, snow and ice, the cryosphere, ice cores, oceanography, submarine topography, sea ice, ocean chemistry, meteorology, the ozone hole, the aurora, upper atmospheric physics, meteorites, terrestrial and marine biology, medical research, Japanese research facilities, and international cooperation. Also included is a chronological table of major historical events and scientific activities in Antarctica from 1675 to 1989. The text and figures are all in Japanese but there are English-language terms scattered throughout and a bibliography of about 290 references of which a few are in Russian, about 50 in Japanese, and the rest in English.

A-44832

Bonner, W.N., **International agreements and the conservation of antarctic systems**, *Antarctic ecosystems: ecological change and conservation*. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.386-393, 14 refs.

The formal provisions for conservation in the Antarctic are provided by the Antarctic Treaty system. Through the Agreed Measures for the Conservation of Antarctic Fauna and Flora, native mammals or birds are protected; signatories are urged to minimize harmful

interference with the normal living conditions of mammals and birds and to alleviate coastal pollution; provision is made to designate Specially Protected Species and Specially Protected Areas; and the introduction of non-indigenous species is controlled. Subsequent measures created Sites of Special Scientific Interest within which activities are subject to controls described in management plans; control the use of radio-isotopes; and provide a code of conduct for antarctic expeditions and station activities. A recent measure requires the undertaking of environmental impact assessment in the planning of scientific research and its associated logistic activities. A code of conduct for expeditions and stations has been adopted, and revised procedures for waste disposal are under consideration. (Auth. mod.)

A-44836

Sovetskaia antarkticheskaia ekspeditsiia, Bulatov, L.V., ed, **Twenty-ninth Soviet Antarctic Expedition. Winter studies 1983-1985** [Dvadtsat' deviatiaia Sovetskaia antarkticheskaia ekspeditsiia. Zimovochnye issledovaniia 1983-1985 gg.], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, 156p., In Russian. Refs. passim. For individual papers see 46-650 through 46-655 or E-44844, E-44837, F-44840, F-44843, I-44838, I-44839, I-44841 and I-44842.

This volume contains information on observations and results of scientific efforts carried out by the 29th Soviet Antarctic Expedition in the winters of 1983-1985 on the antarctic continent and surrounding waters. Seasonal activities and organization of the expedition, including logistic support and contact with non-Soviet expeditions, are outlined in the first part of the book. The second part consists of 8 individual papers giving the scientific results of projects in oceanography, meteorology, glaciology and geophysics.

A-44845

U.S. National Science Foundation, **Antarctic journal of the United States, Vol.26, No.1**, Washington, D.C., 1991, 19p.

In this issue, these events are reported: Astronomical and astrophysical instrumentation, firmly secured in the gondola of a helium-filled balloon, at launch as large as the Washington Monument and at FA of 130,000 ft 50 times the size of the Goodyear blimp, sailed grandly around the Pole in just nine days; ozone depletion continues to intensify over Antarctica with each successive Spring; progress gained in international cooperation toward protecting the antarctic environment; the unexpected absence of a phytoplankton bloom in Gerlache Strait; GPS satellite positioning of the South Shetland Is. appears to be 0.5 nm too far north; NSF funding awards from Oct. 1 through Dec. 31, 1990; and weather summaries at McMurdo, Palmer, and Amundsen-Scott for Nov. and Dec. 1990 and Jan. 1991.

A-44861

Rudbäck, G.T., Sandkvist, J., Forsman, B., **Icebreaker Oden in polar operations—environmental impact assessment**, *International Conference on Port and Ocean Engineering under Arctic Conditions*, 11th, St. John's, Sep. 24-28, 1991. Proceedings. POAC 91. Vol.2. Edited by D.B. Muggeridge, D.B. Colbourne, and H.M. Muggeridge, St. John's, Memorial University of Newfoundland, 1991, p.812-822, 9 refs.

The Swedish Polar Research Secretariat will use the new Swedish icebreaker *Oden*, operated by the National Maritime Administration, as a platform for a marine high arctic expedition in the summer of 1991. As part of the expedition planning and as a help in the decisionmaking processes involved, an environmental impact assessment has been performed in order to identify and quantify all emissions, discharges and other environmental aspects associated with polar operations. The technical study covers a broad range of different environmental aspects potentially associated with environmental impacts, both for normal operation conditions and potential risks caused by

failures or accidents with the *Oden*. Two separate measurement programs, regarding the underwater noise radiation and the exhaust emissions, have been included in the study. The technical description and the quantitative analyses of the emissions, discharges etc, will be evaluated in relation to a general environmental policy formulated for all scientific and associated logistic activities in the arctic and antarctic areas. The documentation of the EIA will form a basis for operational guidelines for logistic supporting science activities. This paper gives a brief presentation of the scope, the performance and the results of the technical part of the Oden EIA project. (Auth. mod.)

A-44863

U.S. Naval Support Force, Antarctica, **CNSFA Operation Order No.201**, Aug. 1991, var. p., 97 refs.

This order specifies the duties of the Department of Defense military support for the United States Antarctic Program for the 1991/92 research season, and supersedes CNSFA OPORD 2-88. The primary objective of this document is the delineation of the logistical, administrative and communications responsibilities of the military contingent which supports the annual deployment of scientific resources in Antarctica. Included in the duties of this contingent, whose yearly support activities are designated "Operation Deep Freeze," is the provision and coordination of air personnel and supply transport, to include the deployment of fixed wing and helicopter aircraft; the assignment, regulation and monitoring of radio frequencies to be used in all forms of radio communications; icebreaker deployment; and the provision of meteorological data critical to the operations of the scientific community.

A-44905

Spain. Comisión Interministerial de Ciencia y Tecnología, **Antarctic Treaty: Spanish antarctic research program, expedition 1990-1991. Information exchange under Article VII(5)** [Tratado Antártico: Programa español de investigación antártica, campaña 1990-1991. Intercambio de información según el Artículo VII(5)], [Madrid, 1990], 24p., In English and Spanish.

As exchanged information on planned activities for the summer of 1990-1991, the items covered include: ships' description, itinerary and operations; Juan Carlos I. Station's research facilities and logistics; telecommunications equipment and schedules; list of participating organizations and scientists; scientific projects in various disciplines and at different locations; and joint projects with Chile and the United States.

A-44906

Beltramino, J.C.M., **Resources and environment under the Antarctic Treaty System** [Recursos y medio ambiente en el sistema del Tratado Antártico], *Ambiente y recursos naturales*, Jan.-Mar. 1990 7(1), 11p., In Spanish. 10 refs.

The discussion covers the growing concern of the international community for the protection and conservation of the antarctic environment and resources, and a solution contemplated in the framework of the Antarctic Treaty System.

A-44909

Molinari, A.E., **Scientific research within the antarctic mineral regime (CRAMRA)**, Actas de la Primera Conferencia Latinoamericana sobre Geofísica, Geodesia e Investigación Espacial Antárticas. (Latin American Conference on Antarctic Geophysics, Geodesy and Space Research, 1st, Buenos Aires, July 30-Aug. 3, 1990. Proceedings), [Buenos Aires,] Centro Latinoamericano de Física, [1990], p.109-113, 2 refs.

One of the principles on which the structure of the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAM-

RA) is based, the principle aiming at the establishment of the fields of CRAMRA's research, is discussed. Three pertinent areas are reviewed: maintenance and protection of freedom in scientific research; relevance of scientific research within the institutions of the regime; and the scientific research within the different stages of mineral activities, i.e. prospecting, exploration and exploitation. It is concluded that the provisions of the Convention cover adequately each of the above areas.

A-44910

Korean National Committee on Antarctic Research, **Korean antarctic research report to SCAR No.4—1991. Record of activities: 1 April 1990-31 March 1991. Planned activities: 1 April 1991-31 March 1992**, Seoul, 1991, 41p., Refs. p.33-38.

This report outlines the Korea Antarctic Research Program completed during the period Apr. 1990 through Mar. 1991, and that planned for the period Apr. 1991 through Mar. 1992. The activities include studies in atmospheric science, biological oceanography, chemical oceanography, geology, geophysics and human physiology. The planned activities will be in the fields of biological oceanography, geology and geophysics. A list of principal investigators and responsible authorities is also provided.

A-44911

Beltramino, J.C.M., **Protection of nature and development of human activities in Antarctica** [Protección de la naturaleza y desarrollo de actividades humanas en Antártida], 1991, 18p., In Spanish. Unpublished manuscript.

The plan of this lecture, held on Mar. 4, 1991, at Leopold Franzens University, Innsbruck, Austria, consists of the following 4 parts: the antarctic natural environment and the problems of human activities; normativeness in the Antarctic Treaty System for resource conservation and environmental protection; conservation and protection in the political context and in their practical application; and prospects for the near future.

A-44912

Beltramino, J.C.M., **Discoveries of Antarctica**, 1990, 13p., Unpublished manuscript. 17 refs.

The thesis of this lecture, held on May 29, 1990, at the Australian National University in Canberra, is that what is called the discovery of Antarctica as a whole, i.e. Antarctica as a concrete, geographic space, is the result of many separate discoveries brought about by a collective enterprise of interested individuals and nations. The history of expeditions to Antarctica is reviewed, including the voyage of circumnavigation by Cook and other discoverers from the second decade of the 19th century on. The human activities in Antarctica, preceding the implementation of the Antarctic Treaty and following it, are examined. The evolution of the Antarctic Treaty System, and its regulatory activities concerning the protection of the antarctic environment and conservation of its resources, are discussed.

A-44976

South Africa. Weather Bureau, **Newsletter/Nuusbrief, No.505, Apr. 1991**, 1991, 28p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough Islands, and at Sanae Station, along with general news items are reported. Included are weather reports with tables and graphs for the month of Apr. 1991. Hemispheric circulation anomalies during that month are discussed and illustrated.

A-44977

South Africa. Weather Bureau, **Nuusbrief/News letter, No.501, Dec. 1990**, Pretoria, 1990, 24p., Text and titles in Afrikaans or English.

South African research activities on Marion and Gough Islands, and at Sanae Station, along with general news items, are reported. Included are weather reports and tables covering moon, cyclone, rain and ozone observations for Dec. 1990. Daily weather charts for that month are also presented.

A-44979

New Zealand Antarctic Society, **Antarctic, Vol.12, No.1**, Christchurch, [1991], p.1-40.

Research activities carried out by New Zealand, Australia, the United Kingdom and the United States are outlined. Details are given of algal and zoological studies; news from the Australian stations, such as a fire at Mawson and a fuel spill at Casey; BAS long term plans for antarctic science programs; and monitoring of the effects of the Bahia Paraiso oil spill. Tourism and Greenpeace activities are summarized; an obituary and an extensive book review conclude the issue.

A-44980

New Zealand Antarctic Society, **Antarctic, Vol.12, No.5**, Christchurch, 1991, p.129-168.

Research activities carried out by New Zealand, Australia, Finland, France, the United Kingdom and the United States are outlined. These include the following: a cooperative geological project involving scientists from the United Kingdom, the United States and New Zealand; territorial behavior of skuas; further studies on fish, worms and pollutants; the changes in Adélie penguin populations; a hydrographic survey of the approaches and anchorages in the vicinity of Australian stations; and the cancellation of the ABOA program. News items cover the 41st French Antarctic Expedition; the replacement of RRS *John Biscoe* by RRS *James Clark*; twenty-two projects at the South Pole; the implementation of the Auckland Islands Management Plan; the XIth Special Consultative Meeting on antarctic environment; tourism; and plans to recover a motor sledge lost by R.F. Scott in 1911.

A-44993

Fogg, G.E., Smith, D., **Explorations of Antarctica: the last unspoilt continent**, London, Cassell, 1990, 224p., Refs. p.218-221.

DLC G870.F58

Maps, engravings, lithographs and a selection of oils and water-colors, depicting the antarctic natural scenery and recording historic events related to the exploration of Antarctica, are presented in this book in the form of photographs. These are accompanied by a text which covers the subject, from the discovery of Antarctica through its exploration and the economic, political and environmental consequences of the scientific research carried out on the continent and the surrounding oceans over the years.

A-44994

Audisio, A., ed, **Antarctic adventure, images and history** [L'avventura antartica, immagini e storia], Turin, Museo Nazionale della Montagna "Duca degli Abruzzi", 1990, 225p., In Italian.

This volume presents a collection of photographs and paintings exhibited by the Museo Nazionale della Montagna of historic events and individuals related to antarctic discovery and exploration. They are accompanied by articles describing the depicted expeditions, from J. Cook's voyage in 1772-75 to V. Fuchs' expedition of 1955-58; an appendix listing antarctic stations and bases; a discussion on Antarctica from a legal point of view; and an outline of the Italian antarctic program.

A-44996

New Zealand. Department of Scientific and Industrial Research. Antarctic Division, **New Zealand antarctic research programme, 1990-91**, Christchurch, [1990], 46p.

The 1990-1991 New Zealand antarctic research program will involve some 245 scientists, base support and field staff. In all, there will be 56 projects undertaken, with most of the scientific activity being conducted in and around Ross I., McMurdo Sound and the Dry Valleys. Six divisions of the Department of Scientific and Industrial Research will be involved in 30 separate events. All projects are briefly outlined and cover many disciplines, including biology, meteorology, geology, atmospheric physics and glaciology.

A-44997

New Zealand. Department of Scientific and Industrial Research. Antarctic Division, **Antarctic field manual, 1990**, Christchurch, 1990, 112p.

This manual is for guidance to field events, which are defined as parties leaving Scott Base by surface or air transport on a scheduled program for scientific, support, maintenance or recreational reasons. With the greatest emphasis on safety, the information contained in the manual is the result of many years of experience in Antarctica, covering field travel, flying, surface transport, field organization and camping, search and rescue, field communications, clothing and equipment.

A-44998

New Zealand. Department of Scientific and Industrial Research. Antarctic Division, **Antarctic operations manual, 1990**, Christchurch, 1990, 90p.

This manual is provided to assist all persons attached to the New Zealand Antarctic Research Programme in becoming informed of New Zealand's activities in Antarctica, and their individual role and responsibilities. The program's administration, operations and obligations specified in the Antarctic Treaty regarding conservation and protection of antarctic environment are discussed.

B. BIOLOGICAL SCIENCES

B-42876

Howes, G.J., **Syncranial osteology of the southern eel-cod family Muraenolepididae, with comments on its phylogenetic relationships and on the biogeography of subantarctic gadoid fishes**, *Zoological journal of the Linnean Society*, Sep. 1990 100(1), p.73-100, 55 refs.

The monogeneric gadoid family Muraenolepididae has been neglected both taxonomically and anatomically. Without good evidence it has been the opinion of most authors that the family possesses mainly primitive features. A comparison of the syncranial osteology with that of other taxa shows that this can be refuted and that *Muraenolepis* is a relatively derived "higher" gadoid, having its relationships close to the Phycidae and Gadidae. The circum-antarctic distribution of *Muraenolepis* is unique within gadoids and poses the question of its origin. This is discussed with reference to bipolar distributions exhibited by some other gadoid families. It is concluded that gadoids have evolved with the Atlantic continental shelves, and their distribution (and bipolarity) is a consequence of the geological processes which have formed the Atlantic Ocean. (Auth.)

B-42877

Tucker, M.J., Burton, H.R., **Seasonal and spatial variations in the zooplankton community of an eastern antarctic coastal location**, *Polar biology*, Oct. 1990 10(8), p.571-579, Refs. p.578-579.

The zooplankton community of a shallow coastal area in East Antarctica was found to be one of low species diversity dominated by Copepoda. Most species of copepods displayed a marked seasonality in abundance, with peak numbers between Mar. and May. It is proposed that several factors, including phytoplankton seasonality, contribute to the zooplankton species composition, zooplankton seasonality, and to the temporal differences in the period of maximum abundance between copepod species. Annual vertical migratory behaviour in conjunction with the circulation of Prydz Bay are important determining factors for those species which can be considered as oceanic. However, for copepod species which can be classified as in-shore residents, it is their association with the ice-water interface that determines their seasonal appearance and abundance. Some differences were established between the zooplankton community of the Vestfold Hills and that of other antarctic coastal regions. (Auth. mod.)

B-42878

Ring, R.A., Block, W., Somme, L., Worland, M.R., **Body water content and desiccation resistance in some arthropods from subantarctic South Georgia**, *Polar biology*, Oct. 1990 10(8), p.581-588, 26 refs.

The body water content and resistance to desiccation were studied in two perimylopod beetles, *Perimylops antarcticus* and *Hydromedion sparsutum*, a chironomid midge, *Eretmoptera murphyi*, and two spiders, *Notiomaso australis* and *Perimaso grytvikensis* from South Georgia. Comparisons were made among different species, different life stages and, where possible, between a high and a low altitude. *Perimylops* is abundant at higher elevations and in more exposed habitats (fellfields). *Hydromedion* is more abundant at the lower collection site. Water loss rates for both beetles are significantly higher than those reported for related beetles from arid and semi-arid regions. The ability to regulate water loss is not as apparent in the polar perimylopods *Perimylops* and *Hydromedion* as in related species from

other xeric habitats. Among the spiders, sufficient information could be obtained only for *Notiomaso*. This species is much less resistant to desiccation than the perimylopod beetles, and it has a relatively high body water content. It is quite numerous in the lower, warmer habitats where its insect prey is more abundant and diverse. (Auth. mod.)

B-42879

Wiencke, C., **Seasonality of brown macroalgae from Antarctica—a long-term culture study under fluctuating antarctic daylengths**, *Polar biology*, Oct. 1990 10(8), p.589-600, Refs. p.598-600.

The seasonal development of the endemic antarctic Desmarestiales *Himantothallus grandifolius*, *Phaeurus antarcticus*, *Desmarestia anceps*, of a ligulate *Desmarestia* sp., of the antarctic cold-temperate *Adenocystis utricularis* (Dictyosiphonales) and of the endemic antarctic *Ascoseira mirabilis* (Ascoseirales) was monitored in a 2-year culture study under fluctuating daylengths mimicking the daylength conditions on King George I. Sporophytes were initiated between June and July in all Desmarestiales. This event was controlled either by induction of gametophyte fertility (in *H. grandifolius* and *D. anceps*) or by induction of spore formation (in *Desmarestia* sp. and *P. antarcticus*). Young sporophytes of all species showed a growth optimum from Sept. to Dec. The results closely correspond to available field data and indicate that the phenology of the studied species can be controlled in the laboratory solely by simulating antarctic daylength conditions. The light requirements for growth were very low in microthalli and in juvenile macrothalli. (Auth. mod.)

B-42880

Wiencke, C., **Seasonality of red and green macroalgae from Antarctica—a long-term culture study under fluctuating antarctic daylengths**, *Polar biology*, Oct. 1990 10(8), p.601-607, 36 refs.

The seasonal development of the endemic antarctic alga *Palmaria decipiens* (Palmariales, Rhodophyta) and of the antarctic-cold temperate algae *Iridaea cordata*, *Gigartina skottsbergii* (Gigartinales, Rhodophyta), *Enteromorpha bulbosa* (Ulvaes, Chlorophyta) and *Acrosiphonia arcta* (Acrosiphoniales, Chlorophyta) was monitored during 2 years in a culture study under fluctuating daylengths mimicking the conditions on King George I. In *P. decipiens*, blades on germlings and on thalli from the previous season are initiated under antarctic winter conditions and show maximum growth in Oct. Formation of blades on old thalli of *I. cordata* and *G. skottsbergii* started between June and Aug.; maximum growth occurred in Dec. Sporangia started to form in *G. skottsbergii* in Sept. and Mar. and spore release was observed 9 months later. *E. bulbosa* and *A. arcta* grew optimally in Nov. and Dec. conditions. The values for minimum light requirements for completion of the life cycle suggest lower distribution limits of either 53 plus or minus 23 m, 49 plus or minus 22 m and 38 plus or minus 17 m in clear offshore waters, or of 28 plus or minus 5 m, 26 plus or minus 5 m and 20 plus or minus 4 m in small inshore fjords of the Antarctic Peninsula region. (Auth. mod.)

B-42881

Fiala, M., Oriol, L., **Light-temperature interactions on the growth of antarctic diatoms**, *Polar biology*, Oct. 1990 10(8), p.629-636, Refs. p.635-636.

The combined effect of various temperatures and light intensities on the growth of 7 species of antarctic diatoms in culture has been

studied. With the exception of *Chaetoceros deflandrei* whose thermal tolerance is fairly good, these obligatory psychrophils cannot survive in temperatures above 6-9°C. Their mean growth rate is relatively low, between 0.24 div/d for *Corethron criophilum* and 0.63 div/d for *C. deflandrei*. Regardless of light intensity, growth rate increased with the temperature to reach a maximum between 3 and 5°C. Results suggest that the combined effect of temperature and light is one of the factors involved in the limitation of antarctic phytoplankton growth. The low temperatures of the environment do not permit rapid growth, which, even under optimal light conditions, remains low. In addition, in the euphotic layer, the overall light energy available for algae is considerably reduced due to turbulence, a factor which exacerbates the reduced growth rate. (Auth. mod.)

B-42885

Chown, S.L., **Speciation in the sub-Antarctic weevil genus *Dusmoecetes* Jeannel (Coleoptera: Curculionidae)**, *Systematic entomology*, July 1990 15(3), p.283-296, 47 refs.

Relatively few instances of sympatric speciation have been reported in the literature, and both theoretical and empirical studies of this mode of speciation remain controversial. Recently, a model of sympatric speciation less restrictive than earlier ones has been proposed. This study presents a hypothetical speciation scenario, based on current observations, which seems to be consistent with the new model. Two morphologically similar, though ecologically separated, species are identified in the *Dusmoecetes similis* (C.O. Waterhouse) species complex on Marion Island, based on a study of the morphology, biology and ecology of the group. Differences between the demands placed on angiosperm- and bryophyte-feeding members of the complex, and the differing demands of bryophyte and angiosperm-dominated communities, coupled with low vagility and a high degree of assortative mating, suggest that a sympatric model can be used to explain speciation in this genus, which probably occurred within the last 10,000 years. Differences between *Dusmoecetes marioni* Jeannel and *D. similis* (Waterhouse) are discussed, and a lectotype designated for the latter species. (Auth.)

B-42886

Eppley, Z.A., Rubega, M.A., **Indirect effects of an oil spill: reproductive failure in a population of South Polar skuas following the *Bahia Paraiso* oil spill in Antarctica**, *Marine ecology progress series*, Sep. 1990 67(1), p.1-6, 34 refs.

A complete reproductive failure is reported in a population of seabirds as an indirect result of the *Bahia Paraiso* oil spill near Palmer Station in Antarctica. Mortality among nestling South Polar skuas was highly compressed in time and was coincident with the spill. Adults were observed to forage in oil slicks and became fouled, but there was no transfer of oil to eggs or chicks. Young showed no evidence of toxicity (low growth rates or hemorrhagic gastroenteritis) and adult mortality was minimal. Instances of parental neglect increased 10-fold after the spill and undefended chicks were attacked by neighboring skuas. It was suggested that exposure to oil caused a short-term disruption of normal parental attendance behavior which exposed young to fatal intraspecific aggression. This example emphasizes that behavior and ecological interactions play major roles in determining the effects of oil on species. While these factors may be understood *post hoc*, correctly predicting the effects of environmental perturbations on species is a formidable task. (Auth.)

B-42887

Mauri, M., Orlando, E., Nigro, M., Regoli, F., **Heavy metals in the antarctic scallop *Adamussium colbecki***, *Marine ecology progress series*, Sep. 1990 67(1), p.27-33, 24 refs.

Cu, Fe, Cr, Cd, Mn and Zn concentrations were determined in different organs of the antarctic scallop *Adamussium colbecki*

(Smith) and compared with those found in *Pecten jacobaeus* L., a scallop of temperate waters, and with literature values for other Pectinidae. The digestive gland of *A. colbecki* was the target organ for Cu, Fe, Cr and Cd, whereas Mn and Zn were found mainly in the kidney. Cd concentration in the digestive gland of *A. colbecki* was higher than that in the same organ of *P. jacobaeus*, indicating a marked ability of the antarctic scallop to concentrate this metal. However, in *A. colbecki* renal concentrations of both Mn and Zn were considerably lower than those measured in *P. jacobaeus* and other Pectinidae, and may be related to the scarcity of concretions observed in its kidney. (Auth.)

B-42888

Woods, R.W., **Guide to the birds of the Falkland Islands**, Oswestry, Shropshire, England, Anthony Nelson Ltd, 1988, 256p., Bibliography p.243-248.

The book provides a comprehensive guide to the identification of all 185 species known to have been recorded on the Falkland Is. or within the 200 mile zone of surface water surrounding the archipelago. Twenty-one color plates by Franklin Coombs illustrate all breeding species and most of the non-breeding visitors and vagrants. Short notes on field identification are given opposite the plates and birds not illustrated are listed. Identification notes are cross-referenced to the main text, where full details on each species are provided. Several birds that have not yet been recorded are mentioned in the text where separation from similar species is difficult. A checklist is provided with a number and a coded summary for the status of each species. The book can be used merely as a field guide, by reference to the plates and checking with the full descriptions in the text. The Introduction gives an extensive description of many factors that affect the birds of the Falkland Is. and a historical summary of ornithological and conservation activity. The many influencing factors include topography, coastline, soils, landscape, climate, surrounding seas, tussock grass and other vegetation, terrestrial animals, and human factors. An explanation of scientific classification and general notes on distribution of breeding birds and the occurrence of vagrants, complete the Introduction. Preceding the field guide are notes on abbreviations used and a diagram showing the plumage of a bird. The headings describing breeding and non-breeding species are explained. (Auth. mod.)

B-42889

Duck, C.D., **Annual variation in the timing of reproduction in antarctic fur seals, *Arctocephalus gazella*, at Bird Island, South Georgia**, *Journal of zoology*, Sep. 1990 222(1), p.103-116, 44 refs.

The arrival of antarctic fur seals at a breeding beach on Bird I., South Georgia, was studied over five consecutive breeding seasons, 1983 to 1987. Experienced bulls arrived first and established breeding territories on the beaches in anticipation of the arrival of the cows. Male arrival, which is less synchronous within years than female arrival, was significantly later in 1987 than in any other year. Female arrival, estimated by pup birth date where necessary, was highly synchronous; it usually started when 80% or more of potential territory sites were occupied by males. Cows arrived significantly later in 1984 and 1987 than in 1983, 1985 or 1986. The late arrival of both males and females in 1987 is attributed to unusually severe climatic conditions during the preceding winter. The late arrival and reduced fecundity of females in 1984 is attributed to markedly reduced food availability during the austral winter and summer of 1983. Males were not affected in 1984 because they could move away from the area of reduced food availability earlier than females, and because they have a more varied diet. Factors influencing the winter distribution, the timing and pattern of arrival, and the breeding of male and female antarctic fur seals are discussed.

B-42894

Inoue, M., Sato, Y., Naito, Y., **Field surveys on terrestrial biology in the vicinity of Syowa Station, East Antarctica, 1986-1987 (JARE-27)**, *Antarctic record*, July 1990 34(2), p.156-174, In Japanese with English summary. 3 refs.

Field surveys of terrestrial biology, carried out Jan. 1986-Feb. 1987 in conjunction with a 5 year study of the antarctic ecosystem in the ice free areas near Showa Station, are described. A biological observation hut was constructed at the mouth of the Yukidori Valley; plans of the interior and roof of the hut are presented. A large number of samples for taxonomic studies of lichens were collected along the Soya and Prince Olav coasts.

B-42898

Ohyama, Y., Shimada, K., **Japan-China collaborative research of terrestrial biology at Great Wall Station, King George Island in 1989/90**, *Antarctic record*, July 1990 34(2), p.235-241, In Japanese with English summary. 1 ref.

The collaboration between Japanese and Chinese biologists started in the 1988/89 season with a three-year program at the Great Wall Station. Two Japanese zoologists participated in the 6th Chinese Antarctic Research Expedition and carried out the ecological survey of terrestrial invertebrates and the study on cold-hardiness of some terrestrial arthropods. The ecological survey comprised the measurement of microclimatic conditions of moss communities and sampling of invertebrates from various habitats. An oribatid mite, a springtail and a podonomine midge were examined for the study on adaptation to the cold climate. (Auth. mod.)

B-42950

MD 42/SIBEX on board the Marion Dufresne, Jan. 3-Feb. 18, 1985 [MD 42/SIBEX à bord du *Marion Dufresne* 3 janvier-18 février 1985], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, 210p., Refs. passim. For individual papers see B-42952, B-42954 through B-42965, J-42951, J-42953 and 15B-32723.

This volume is a collection of individual reports on research, carried out between the Kerguelen Is. and Prydz Bay on board the *Marion Dufresne* Jan. 3-Feb. 18, 1985, to estimate the abundance the distribution of krill *Euphausia superba*, its physical and chemical environment and its predators. The program included not only krill studies, but also physical and chemical hydrological surveys; work on organic particle, chlorophyll and production distribution; zooplankton investigations; mid-water and bottom trawling for fish and benthic organisms; and numerical data on the abundance of seabirds.

B-42952

Panouse, M., **Light penetration and phytoplankton biomass in the Indian Ocean** [Pénétration de la lumière et biomasse du phytoplancton dans le secteur indien de l'océan antarctique], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.43-55, In French with English summary. 5 refs.

The light penetration and chlorophyll *a* measurements made during the SIBEX cruise show some differences with the data previously collected in this area of the antarctic ocean, such as a quite important increase of the mean turbidity in the euphotic layer. If the correlation between the mean extinction of light and the mean density of pigments through the euphotic layer remains significant, the data analysis marks a much stronger influence of factors other than pigments (Chlorophyll *a* and Pheophytin *a*) upon the attenuation of light. (Auth.)

B-42954

Bedo, A., Mayzaud, P., Corre, M.C., **Krill trophic environment: biochemical and granulometric seston characteristics in the Indian Ocean during summer** [Définition de l'environnement trophique potentiel d'*Euphausia superba*: caractéristiques biochimiques et granulométriques du seston durant l'été austral dans le secteur sud indien de l'océan antarctique], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.71-86, In French. Refs. p.85-86.

As a continuation of the ANTIPROD III-ASPARA 2 survey of spectral and biochemical characteristics of natural particulate matter in the Indian Ocean, the krill trophic environment is defined during SIBEX and data on granulometric and biochemical composition in the 0-200 m water layer, in the same area of investigation, are presented. In a comparison of results from both studies, differences and similarities are pointed out.

B-42955

Miquel, J.C., **Krill fishing and populations in the Indian Ocean sector of the antarctic ocean** [Données sur les pêches et les populations de krill *euphausia superba* dans le secteur indien de l'océan antarctique], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.87-103, In French. 12 refs.

Data on population composition, and spatial and size distribution of krill, obtained during MD 42-SIBEX investigations in the north-north-west area of Prydz Bay in summer 1985, are discussed and presented in tables. It is found that juveniles and immature krill occur mainly west of 70E and south of the Polar Circle, while eastward, toward longitude 80E, krill populations consist of mature, largely male adults.

B-42956

Cuzin-Roudy, J., **Biology of krill *Euphausia superba* Dana** [Biologie du krill antarctique *euphausia superba* Dana], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.105-114, In French. 8 refs.

A total of 208 krill individuals were observed alive to determine body size, the stage and age of sexual maturity, external structures, and molt stage. Sixty-four were fixed and studied histologically. Tabulated results are presented.

B-42957

Roche-Mayzaud, O., Mayzaud, P., **Individual variability of krill digestive metabolism** [Influence de la variabilité individuelle dans l'étude du métabolisme digestif d'*euphausia superba* (Dana)], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.115-124, In French. 3 refs.

A study of carbohydrase and protease activity in the krill digestive system, and its relationship to krill nutritional environment, was carried out on samples collected during SIBEX, Jan.-Feb. 1985, in an area between latitude 60S and Prydz Bay. Results of *in situ* determination of the level of digestive metabolism in krill individuals—in relation to the ingestion, the biochemical composition of particulate matter and data on chlorophyll fluorescence in 0-100 m water layer—are discussed. It is concluded that the spatial evolution of digestive enzyme activities is not, in this case, directly related to the trophic environment.

B-42958

Duhamel, G., **MD 42-SIBEX expedition: ichthyology** [Campagne MD42/SIBEX: ichtyologie], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.125-131, In French.

A study of ichthyoplankton and mesopelagic and demersal ichthyofauna, carried out during the MD 42-SIBEX expedition between Heard I. and Prydz Bay, is reported. Three types of fishing equipment, and their use at numerous stations, are described. A list of operations is appended, specifying the stations' numbers and geographic locations, length of cables and types of nets used, and dates and depth ranges in which the fishing operations took place.

B-42959

Camus, P., **Mesopelagic and benthic fish eggs and larvae** [Ichthyoplancton (oeufs et larves de poissons méésopélagiques et benthiques)], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.133-148, In French. 13 refs.

Three main aspects are considered in this ichthyological program carried out during SIBEX-MD42: localization of spawning places and nurseries of exploitable species of fish along 44 stations between Kerguelen I. and Prydz Bay; collection of material to complete, and describe, the different larval stages and biogeographic data of fish in that sector of the Indian Ocean; and acquisition of resource exploitation data to determine the significance of mortality rates of fish and krill in Prydz Bay caused by fishing. Results are presented in tables and charts.

B-42960

Duhamel, G., Williams, R., **MD42/SIBEX expedition: demersal ichthyofauna—analysis of trawl catches** [Campagne MD42/SIBEX: ichtyofaune demersale—analyse des captures de chalut à perche], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.149-172, In French.

Fishing expeditions in waters surrounding Heard I. and in Prydz Bay are described. Tables and charts are presented showing the locations where the trawling was carried out, the species and number of specimen captured, abundance, the maximum biomass, stomach contents, and equipment used. It is concluded that the MD42/SIBEX expedition underlines the importance of comparative studies of fish populations around Kerguelen and Heard Islands, and the determination of deep water ichthyofauna of the Indian Ocean.

B-42961

Hulley, A., **Cruise MD42/SIBEX: mesopelagic ichthyofauna**, *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.173-181, 5 refs.

The objectives during Cruise MD42/SIBEX were to provide data on mesopelagic fishes, especially lanternfishes (family Myctophidae) in answer to the following key-questions: what species occur in the Indian sector of the southern ocean, south of the Antarctic Polar Front, and how do their distribution patterns compare with similar patterns established for the Atlantic sector; and do meristics warrant the distinction of separate populations in the sector, or is circumpolar subantarctic/antarctic distribution more uniform than that at lower latitudes. All specimens were identified as to species and were measured and weighed; larval and post-larval specimens have also been identified. The stage of sexual maturity was determined on board for female lanternfishes only; this analysis is being extended to other

families in the laboratory. Specimens of certain, mainly benthic families have not been identified as to genus and species, but are included for the sake of completeness. Tabulated results are presented.

B-42962

Ozouf-Costaz, C., **Program of fish cytogenetics** [Programme de cytogénétique des poissons], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.183-189, In French. 11 refs.

Thirty-two specimens of the Nototheniidae and Muraenolepidae species, 21 from around Heard I. and 12 from Prydz Bay, have been karyotyped, and the available chromosome data are discussed. Tabulated results are presented.

B-42963

Beurois, J., **MD42/SIBEX expedition: benthic invertebrates** [Campagne MD42/SIBEX: invertébrés benthiques], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.191-195, In French.

A collection of benthic invertebrates was carried out during 48 hours of trawling in waters 150-600 m deep surrounding Heard I., and 18 hours in Prydz Bay at 450-850 m depths. Results are presented in tables showing dates, station number and location, depth, and abundance and type of catch.

B-42964

Monniot, C., **Ascides of MD 42** [Ascidies de MD 42], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.197-200, In French.

Ascidians collected during the MD 42/SIBEX expedition are listed by species and station location. Some new species found are described.

B-42965

Goy, J., **Medusas of the MD 42/SIBEX expedition** [Les meduses de la campagne SIBEX-MD 42], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.201-204, In French.

The importance of medusas in the food chain of the marine ecosystem is discussed. A list is provided of species collected during the SIBEX-MD 42 expedition, with comments regarding their geographic distribution and exploitation.

B-42998

Bonner, W.N., **Antarctic wildlife and its conservation**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.258-269, Refs. p.268-269.

Antarctic terrestrial ecosystems have few direct counterparts in Arctic and alpine regions. The marine ecosystem presents a striking contrast. Rich species assemblies produce locally high production which is utilized by unique short food-chains. Much of the energy produced is channelled through a single organism, antarctic krill, to higher predators, seals, whales and birds. Krill has a startlingly high biomass and is the key species in the marine ecosystem. The Agreed Measures for the Conservation of Antarctic Fauna and Flora and other measures made under the Antarctic Treaty, together with the Convention for the Conservation of Antarctic Seals, the Convention on the Conservation of Antarctic Marine Living Resources and the environmental provisions of the Convention on the Regulation of

Antarctic Mineral Resource Activities provide a legal framework for proper conservation of this unique and extensive part of the earth. Indications at present are that conservation and environmental protection are given high priority by those operating research stations in the Antarctic. (Auth. mod.)

B-42999

Wang, R., Chen, S., **Population structure of antarctic krill (*Euphausia superba* Dana) in the waters north and west of the Antarctic Peninsula**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.270-276, 15 refs.

Examined were 3852 specimens of *Euphausia superba* from different sampling localities. The length-frequency distribution for all the samples showed a monomodal structure dominated by adults or subadults. By means of percent similarity indices of L-F distribution and that of sexual maturity stage composition, the catches can be clustered into 3 groups: Group A, which was found in the open waters north of the South Shetland Is. and in the Bellingshausen Sea, has the largest body length (47.0 mm), the highest percentage of adults (94.5%) and the highest percentage of gravid and spent females (35.8% in females); Group B, around the South Shetland Is., consisting of 62.3% adults, 27.6% subadults and 10.1% juveniles; and Group C, found in the southern part of the Bransfield Strait and near the Antarctic Peninsula Cape, which has the smallest body length (40.6 mm) and lowest sexual maturity. Among 3640 individuals of which the sex could be determined, only 38.1% were males. Evidence shows that the larger the body length the smaller the percentage of males. (Auth. mod.)

B-43000

Zhu, B., Wang, X., **Study of fluoride and biochemical components in antarctic krill (*Euphausia superba*)**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.277-283, 15 refs.

Concentrations of fluoride, protein, fat, carbohydrates, inorganic elements and amino acids have been studied in body parts of krill collected during the 1984-1985 season in the vicinity of King George I. The highest fluoride content, an average value of 4303 ppm, was found in the carapace; 1890 ppm in the cephalothorax; and 1191 ppm in the whole raw krill. The lowest fluoride content, a mean value of 370 ppm, was found in the muscle. Other values show 66.3% protein, 11.5% fat, 1.7% carbohydrates, 5.94% inorganic elements, and 15.6% ash. There are 18 kinds of amino acids in krill. The study shows that krill is a suitable feed for prawn and other commercial fish, and is also of potential value as a food source for man if the fluoride could be reduced by effective processing techniques. (Auth. mod.)

B-43001

Zhang, H., Xia, W., Chen, X., Zhu, B., Zheng, B., **Preliminary study of fluoride anomaly in antarctic krill (*Euphausia superba*)**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.284-288, 16 refs.

Based on measurements of fluoride content in krill, seawater and sediment, the paper discusses the distribution pattern of fluoride in different parts of krill, the existing form of fluoride, and the possible enrichment mechanism. Distribution, migration and the equation of fluoride in krill, and in the environment in which it lives, are also discussed. Results show that fluoride can be enriched up to 4075 micrograms/g in krill's carapace, much more than in its muscle, 237 micrograms/g. Fluoride is slightly higher in antarctic waters, and lower in the sediments, in relation to other oceans. (Auth. mod.)

B-43002

Guo, N., Fu, X., **School searching and echo image analysis of krill (*Euphausia superba*)**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.288-295, 6 refs.

Continuous searching for krill is reported, conducted by echo sounding, within an area of about 100,000 sq km, in waters around the South Shetland Is. and northwest of Adelaide I., from Jan. 1 to Feb. 12, 1985. Large amounts of krill echo images were recorded and, through trial fishing, the basic image features from large schools of krill were found, which could be used as firsthand data for krill detection and exploitation. (Auth. mod.)

B-43003

Chen, X., **Research on shrimping antarctic krill using a mid-water trawl with nylon canvas spreaders**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.296-303, 2 refs.

On the premise that krill is to become an important source of food for mankind, research has been conducted on mastering the technology of krill shrimping, including frame surface trawl nets at boat side, purse seines and mid-water trawls. Fishing experiments have proven the latter to be the most effective. A new trawl with nylon canvas spreaders, developed and used on board the research vessel *Jidi* during shrimping experiments, is described, including the design, features, and structure of the canvas spreaders and net. The fishing operation, control of net position, fishing method and results are explained in detail.

B-43004

Joiris, C.R., **Spring distribution of the higher trophic levels seabirds and marine mammals in the Weddell Sea, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.304-311, 6 refs.

During the EPOS 1 cruise of the icebreaker RV *Polarstern* in the Weddell Sea in spring 1988, the distribution of the higher trophic levels (seabirds, pinnipeds and cetaceans) was quantitatively determined in open water and pack ice. The presence of numerous Chinstrap and Adélie penguins, as well as that of flying seabirds and Cra-beater and Leopard seals, was recorded and is shown on charts. Cetaceans were represented by relatively low numbers, reflecting the fact that most of them, especially the big whales, had not yet returned to their summer feeding grounds.

B-43005

Di Prisco, G., **Oxygen transport in antarctic fishes: structure and function of hemoglobin**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.311-316, 29 refs.

An investigation was initiated on the relationship between the molecular structure and the oxygen-binding properties of hemoglobins of teleosts living in the cold, oxygen-rich antarctic water. The aim of this study is to gain insight into the molecular basis of this adaptation, as well as into the history of fish evolution during the isolation that followed the separation and drift of Antarctica from Gondwana. Data have been collected, in two widely separated regions, on 24 antarctic species from 6 families (Nototheniidae, Bathydraconidae, Harpagiferidae, Artedidraconidae, Zoarcidae and Rajidae), in the course of 4 seasons at Palmer Station and 4 at Terra Nova Bay.

B-43006

Hu, S., Seppelt, R.D., **Moss communities and their characteristics in ice-free areas of the Windmill Islands, Wilkes Land, continental Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.317-324, 13 refs.

The moss vegetation of the Windmill Is. can be classified into the following communities: *Grimmia antarctici*, *Grimmia antarctici-Ceratodon purpureus*, *Bryum pseudotriquetrum*, *Grimmia antarctici-Bryum pseudotriquetrum*, *Ceratodon purpureus*, *Ceratodon purpureus-Grimmia antarctici*, and *Ceratodon purpureus-Bryum pseudotriquetrum*. Four communities occur in wet habitats while 3 communities are found in dry habitats. Microtopography governs the distribution of water supply and therefore community type. Phytocoenological characteristics of the moss communities, such as the dense moss cushions, asexual reproduction (although antheridia or aronegonia have been found in each of the species), abundance of epiphytic algae and lichens growing on the surface of moss hummocks, and the color change of some species in different habitats, appear related to moisture availability, light intensity, wind exposure and temperature. (Auth. mod.)

B-43007

Ohyama, Y., Sugawara, H., **Occurrence of cryptostigmatic mite around Syowa Station area**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.324-328, 10 refs.

The occurrence of a cryptostigmatic mite, *Antarcticicola meyeri*, 30 km south of Showa Station is reported for the first time in that area. The species was discovered in 1967 in the vicinity of Molodezhnaya Station; then, in 1979, it was found in the botanical collection from Mawson Escarpment of the Prince Charles Mountains. Surveys carried out in the Mt. Riiser-Larsen area also revealed the existence of *Antarcticicola meyeri*, which was frequently found on the underside of stones, along with a collembolan of the *Friesea grisea* species. It is concluded that *Antarcticicola meyeri* is endemic to East Antarctica and is widely distributed from 39-68E of the continent. (Auth. mod.)

B-43008

Ye, D., Joiris, C.R., **Bacterial numbers and biomass in antarctic water**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.329-335, 14 refs.

The distribution of bacterial numbers and biomass was investigated in the Indian Ocean sector of the Antarctic, between 38-67S and 18-84E. A total of 239 water samples were taken from 14 depths at 19 stations, from Jan. 11 to Feb. 8, 1987. A clear vertical structure was found in the distribution of bacterial numbers and biomass, showing decrease of both parameters with increase of the sea water density and a strong diminution under the pycnocline. The maximal numbers and biomass occurred in the upper layers above 50 m for most of the sampling stations. Three geographical zones are recognized, considering the bacterial numbers and biomass in the upper (mixed) layers, with boundaries at 38 and 65S. (Auth. mod.)

B-43009

Wu, B., Zhang, K., Yang, Z., Huang, F., **Preliminary study on littoral zone ecosystem of the Fildes Peninsula, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.335-342, 18 refs.

Studies were carried out on the littoral zone ecosystem of Fildes Peninsula and on its related ecosystems, such as infralittoral, shallow water, and fresh water ecosystems of inland lakes, Nov. 1985-Mar. 1986 and Nov. 1987-Mar. 1989. Research was also done on the food

chain closely related to the littoral zone ecosystems, such as sea birds and mammals. Individual developmental and reproductive biology of some invertebrates in the littoral zone was studied in the laboratory of Great Wall Station.

B-43011

Zhou, S., Zhou, Y., Zhao, J., **Electron microscopic observation and electron microprobe analysis of the moss in the water and bed sediments of the West Lake of the Great Wall Station in the South Pole area**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.350-355, 4 refs.

The plants in the water and bed sediments of West Lake in the Great Wall Station area were analyzed by SEM and EMPA; the bottom water plants were identified as Brachythecieas, *Brachythecium populeum* (Hedw.) B.S.G. Green or yellow-green, the plants grow densely in turves; the wall of the leaf cell is thick and smooth, without nodules and differentiating edges. There are no reproductive organs and spores on the plants. A core of 3.4 m deep sediment was divided into 25 layers; plants were identified by their shape and the structure of their cells. Results show that in the geological period of 4000 a, when the sediments were under formation, *Brachythecium populeum* in the lake had no distinct change and succession in shape and structure. The EMPA analysis of the samples shows that they contain Na, Mg, Al, Si, P, S, K, Ca, Ti, Mn and Fe. Among them, Si, Al, and K are positively correlated as are Ca, Mg, S, and Ti. Ca and Si are negatively correlated. The fact that the plants in the bottom water and sediments contain similar elements shows that in 4000 a of sedimentation the water of the West Lake has remained static and without strong external influence. (Auth. mod.)

B-43080

Priddle, J., Watkins, J., Morris, D., Ricketts, C., Buchholz, F., **Variation of feeding by krill in swarms**, *Journal of plankton research*, Nov. 1990 12(6), p.1189-1205, 27 refs.

Gut fullness of 3264 antarctic krill in 38 swarms was estimated using fluorometric determination of chlorophyll *a*. There was a very wide range of gut fullness (maximum value 3277 ng and median of 190 ng) and 7% of the population was classified as empty. There was a similar variability between swarms. Analysis of this variability attempted to partition it among three sources. First, the swarms differed in their composition and it was thought that intrinsic properties of the individual krill might contribute to interswarm variation. Although certain classes of animal had significantly different gut fullness, this was unimportant for the population as a whole. Animal length only accounted for 0.33% of variation, sex-and-maturity stage for 1.6% and moult stage for 4.2% of the variation. By contrast, differences between swarms accounted for 59% of population variability. Second, examination of characteristics of the swarms themselves, such as size, depth and time of sampling, did not yield any property which explained further variability. The final source of variation was likely to be environmental factors, and it is suggested that variation in gut fullness between swarms reflects patchiness in their phytoplankton food. (Auth.)

B-43081

Nichol, S., **Age-old problem of krill longevity**, *BioScience*, Dec. 1990 40(11), p.833-836, 20 refs.

The complexities of growth and ageing in antarctic krill are astounding. Depending on the temperature, krill can molt in 14 or 27 days, casting off 6% of their dry weight at each molt; they lose sexual characteristics at the end of each summer, again resembling two year juveniles with no indication that they were ever older. They lay multiple broods of eggs in a five months season, introducing more uncertainties into the analysis of the age structure; they can survive more than 200 days of starvation, continuing to molt and shrink all the while; to survive during periods of little or no food availability, they may be able to use their own body protein as fuel. All of these pro-

cesses, and perhaps others, blanket the knowledge of krill longevity with enough indeterminants to have a total effect of limiting precision in managing the full resource for use by members of the food web, for replenishing the standing crop, and for commercial exploitation.

B-43083

Detrich, H.W., III, Neighbors, B.W., Sloboda, R.D., Williams, R.C., Jr., **Microtubule-associated proteins from antarctic fishes, *Cell motility and the cytoskeleton*, 1990 17(3), p.174-186, 60 refs.**

Microtubules and presumptive microtubule-associated proteins (MAPs) were isolated from the brain tissues of four antarctic fishes by means of a taxol-dependent, microtubule-affinity procedure. MAPs from these fishes were similar to each other in electrophoretic pattern. Prominent in each preparation were proteins in a half-dozen molecular weight ranges. The surfaces of MAP-rich microtubules were decorated by numerous filamentous projections. Exposure to elevated ionic strength released the MAPs from the microtubules and also removed the filamentous projections. Addition of fish MAPs to subcritical concentrations of fish tubulins at 0-5 C induced the assembly of microtubules. Both the rate and the extent of this assembly increased with increasing concentrations of the MAPs. Sedimentation revealed that approximately six proteins, with apparent molecular weights between 60,000 and 300,000, became incorporated into the microtubule polymer. Bovine MAPs promoted microtubule formation by fish tubulin at 2-5 C, and proteins corresponding to MAPs 1 and 2 co-sedimented with the polymer. MAPs from *C. aceratus* also enhanced the polymerization of bovine tubulin at 33 C, but the microtubules depolymerized at 0 C. It is concluded that MAPs are part of the microtubules of antarctic fishes, that these proteins promote microtubule assembly in much the same way as mammalian MAPs, and that they do not possess special capacities to promote microtubule assembly at low temperatures or to prevent cold-induced microtubule depolymerization. (Auth.)

B-43085

Nichols, P.D., Palmisano, A.C., Rayner, M.S., Smith, G.A., White, D.C., **Occurrence of novel C-30 sterols in antarctic sea ice diatom communities during a spring bloom, *Organic geochemistry*, 1990 15(5), p.503-508, 29 refs.**

The sterol compositions of natural populations of diatom communities in the sea ice at McMurdo Sound were determined during the austral spring bloom of 1985, using capillary GC and GC-MS. A range of sterols (C-26-C-30) was detected in the sea ice diatom communities; 24-methylenecholesterol, brassicasterol and 24-ethylcholesterol were the major sterols at the Cape Armitage, Erebus, Cape Evans and Wohlschlag Bay sites. The similarity of the sterol profiles to those observed in previous studies of antarctic freshwater algal communities strongly indicates that diatoms, rather than cyanobacteria or other algal groups previously proposed, are a more probable source of C-29 sterols in these extreme environments. Two novel 4-methyl-C-30 sterols were also detected: a C-30 sterol showing similar mass spectrum to 4-methyl-24-ethyl-5 α -cholest-22-en-3 β -ol derived from the prymnesiophyte microalga *Pavlova lutheri*, but which was chromatographically resolved from this compound; and a stanol presumed to be derived from the C-30 sterol. 4-methyl C-30 sterols have not been reported previously in diatoms; their presence, and the occurrence of 4-methyl C-28 and C-29 sterols, may be due to temperature-induced adaptations in sterol biosynthetic pathways. (Auth.)

B-43086

Coleman, C.O., ***Bathypanoploea schellenbergi* Holman & Watling, 1983, an antarctic amphipod (Crustacea) feeding on Holothuroidea, *Ophelia*, Sep. 1990 31(3), p.197-205.**

The antarctic amphipod *Bathypanoploea schellenbergi* feeds on a class of echinoderms. Nine out of 12 examined specimens had exclu-

sively ossicles of holothurians and sand grains in the foregut or gut, two specimens had their gut empty and one had apparently ingested a polychaete. The mouthparts show features which are interpreted as adaptations to cut rigid tissue and to deal with mucus. The mandibles are dentate and the strong lacinia mobilis of the left side may serve as an additional cutting edge. The maxillae show a remarkable reduction of hair-like setae. The foregut morphology indicates extensive food storage capabilities. (Auth.)

B-43087

Feller, G., Thiry, M., Gerday, C., **Sequence of a lipase gene from the antarctic psychrotroph *Moraxella* TA144, *Nucleic acids research*, Nov. 11, 1990 18(21), p.6431, 4 refs.**

The gene which confers lipolytic activity to *E. coli* clones growing on plates containing an emulsified lipid, was cloned and sequenced. The nucleotide sequence, 1469 bp in length, is shown along with the region coding for the cold active phase and the flanking sequences.

B-43089

Wang, Z.P., Lin, B.K., Cao, Y.H., **Study of adaptability of *Drepanopus bispinosus* to temperature and salinity in the antarctic Burton Lake, *Science in China, Series B*, July 1990 35(7), p.801-809, 13 refs.**

The tolerance to temperature and salinity of the Calanoida copepod *Drepanopus bispinosus* from Burton Lake in the Vestfold Hills was tested in each season. The results obtained show that the copepod has a marked physiological property of tolerance to low temperature and high salinity, and this property could be strengthened after winter. The response of the copepod to different temperature and salinity evidently expressed seasonal lag characteristics. This means that for a long term in early winter (lower temperature and higher salinity) the animal still has higher tolerance to lower salinity and higher temperature; and it is the opposite in early summer. These physiological features are possibly caused by natural acclimatization in the lake. The correlation of the animal's survival rate with the changes of temperature and salinity presented an approximately smooth surface of a three-degree elliptic sphere. (Auth.)

B-43090

Shaughnessy, P.D., Goldsworthy, S.D., **Population size and breeding season of the antarctic fur seal *Arctocephalus gazella* at Heard Island, 1978-1988, *Marine mammal science*, Oct. 1990 6(4), p.292-304, 27 refs.**

Breeding colonies of the antarctic fur seal *Arctocephalus gazella* on Heard I. are situated on the sheltered northern and eastern coasts on flat vegetated terrain near streams and pools. Pupping in the 1987/88 summer began on Nov. 21, with 90% of births in 26 d. The median birth date was Dec. 11. Pup counts at Heard I. made in seven breeding seasons from 1962/63 to 1987/88 show an exponential rate of increase of 21%, which may be inflated due to undercounting in early years. The total of 248 births in 1987/88 represents an exponential increase of 37% since the previous year, but pups may have been undercounted then. Based on the number of pups born, the breeding population is estimated at 870-1,120. During the breeding season, the largest number of animals ashore was 835. Many non-breeding fur seals began hauling out from early Jan. and 15,000 animals were estimated to be ashore by late Feb., a far larger number than expected from the size of the breeding population. Both the breeding and non-breeding components of the population may be augmented by immigration. The source of immigrants may be undiscovered breeding colonies of this species in the northwestern sector of the Kerguelen Archipelago or the concentration at South Georgia. Further censuses are required at Heard I. to monitor the population growth. (Auth.)

B-43100

Clark, G.S., **Seabird observations between South Georgia and South Africa from a sailing vessel, *Cormorant*, 1987 Vol.14, p.20-30, 4 refs.**

Notes made on birds observed from the yacht *Totorore* during a voyage from South Georgia to South Sandwich Is. and Bouvet I., Sep. 12-Oct. 25, 1985, are summarized. Tables showing maximum number of each species seen at sea in a ten-minute period, and an annotated species list, are presented. A few species were recorded breeding on the South Sandwich Is., but no King Penguins, increasing in numbers on South Georgia, were found nesting on the South Sandwich Is.

B-43101

Roux, J.P., Martinez, J., **Rare, vagrant and introduced birds at Amsterdam and Saint Paul Islands, southern Indian Ocean, *Cormorant*, 1987 Vol.14, p.3-19, Refs. p.17-19.**

Amsterdam I. and Saint Paul I. lie in the center of the southern Indian Ocean, some 500 km north of the Subtropical Convergence. Despite the presence of a permanent station (La Roche Godon) on Amsterdam I. since 1950, the avifauna of these islands remained poorly known until recent years. Nowadays the most abundant species breeding on these islands (total population estimates combined for both islands) are: Northern Rockhopper penguin *Eudyptes chrysolophus moseleyi*, with approximately 55,000 pairs; Indian Ocean Yellow-nosed albatross *Diomedea chlororhynchos bassi*, with 37,000 pairs; Sooty albatross *Phoebastria fusca*, with approximately 250 pairs breeding each year; Fleshfooted shearwater *Puffinus carneipes*, with about 600 pairs; and Antarctic tern *Sterna vittata*, with about 400 pairs.

B-43102

Oatley, T.B., **Antarctic and subantarctic seabird banding totals for the period September 1983-August 1984, *Cormorant*, 1987 Vol.14, p.39-45, 1 ref.**

One of the functions of the Central Data Bank for Antarctic Bird Banding (CDB) is to publish annual summaries of seabird banding efforts at antarctic and subantarctic seabird breeding localities. The provisional total of birds banded in the 1983-1984 year is 10,365 individuals of 31 species. A table gives banding effort at the family level and shows that the penguin, albatross and the petrel-shearwater families have received the most attention, accounting for approximately 93% of the birds banded. No storm petrels or diving petrels were banded during the review period. A table also gives the national contributions to banding totals and lists the banding stations used by each national group.

B-43103

Roux, J.P., **Sooty Albatross *Phoebastria fusca* breeding in the Kerguelen Archipelago: a confirmation, *Cormorant*, 1987 Vol.14, p.50-51, 9 refs.**

Observations are reported which confirm that the Kerguelen Archipelago is the southernmost breeding locality of the Sooty Albatross. The small size of the Jeanne d'Arc Peninsula colony might explain why these birds have been overlooked by some of the few ornithologists who have visited the site. Since most of the Archipelago's coastline (about 3,000 km) has not yet been prospected, it is impossible to assess the size of this population but the scarcity of records suggests a very small one.

B-43104

Londrville, R.L., Sidell, B.D., **Ultrastructure of aerobic muscle in antarctic fishes may contribute to maintenance of diffusive fluxes, *Journal of experimental biology*, May 1990 Vol.150, p.205-220, Refs. p.219-220.**

Quantitative ultrastructural analyses were performed on red (oxidative) and white (glycolytic) skeletal muscles from two species of fish to identify features of subcellular structure that may be related to muscle metabolism at cold body temperature. *Trematomus newnesi* (Boulenger) is an active pelagic species and *Notothenia gibberifrons* (Lönnberg) is a sluggish bottom-dweller. White fibers of both species are poorly vascularized and have low percentages of cell volume occupied by mitochondria. Ultrastructure of oxidative fibers in both species resembles that of cold-acclimated temperate-zone fishes. Mitochondrial volume densities of red fibers reflect differences in ecotype between species. The less clustered array of mitochondria in oxidative fibers of *T. newnesi* compared with *N. gibberifrons* may support an equivalent flux of aqueous metabolites between mitochondrial and cytoplasmic compartments, despite a greater mean intracellular diffusion distance between these compartments in *T. newnesi* than in *N. gibberifrons*. Because oxygen is at least four times more soluble in lipid than in aqueous cytoplasm, lipid may enhance oxygen flux through oxidative muscle and play a role similar to myoglobin in these myoglobin-poor fishes.

B-43105

Fryxell, G.A., Ashworth, T.K., **Diatom genus *Coscinodiscus* Ehrenberg: characters having taxonomic value, *Botanica marina*, 1988 31(4), p.359-374, Refs. p.373-374.**

Based on cultures and net samples of large-celled diatoms from the Weddell Sea and the Gulf of Mexico, characters used to distinguish species within the genus *Coscinodiscus* were analyzed. The characters commonly used to distinguish species have included diameter of the discoid valve, range of areolar size, and areolar pattern, including the presence or absence of a central rosette of areolae. Recent results suggest augmentation with the following characters: comparative average areolar size near the valve center and near the mantle in the same incomplete radial row; relationship to adjacent rows of an incomplete radial row that originates with an areola with a pentagonal-walled chamber; differences in valve shape and thus girdle view of the cell, and re-definition of the rosette to include those with a mesa-like central structure. (Auth. mod.)

B-43106

Hasle, G.R., Sims, P.A., Syvertsen, E.E., **Two recent *Stellarima* species: *S. microtrias* and *S. stellaris* (Bacillariophyceae), *Botanica marina*, 1988 31(3), p.195-206, 21 refs.**

The identity of the two Recent marine centric diatoms, *Stellarima microtrias* (Ehrenb.) Hasle et Sims and *S. stellaris* (Roper) Hasle et Sims as separate species is established by differences in biology, habitat and geographical distribution. *Stellarima microtrias* forms resting spores (and probably also resting cells) and is confined to the Antarctic, being particularly common on or in shelf-ice or in surrounding plankton, whereas *S. stellaris* has not been found to form resting spores or resting cells, and is planktonic in temperate and warm waters. Light microscope examination shows the aerolation of the vegetative valves of *S. microtrias* to be furcate, and that of *S. stellaris* and the resting stages of *S. microtrias*, fasciculate. *S. stellaris* differs from *S. microtrias* in having smaller areolae, wider sectors, a narrow hyaline margin and a valve center almost filled by areolae. (Auth. mod.)

B-43112

Hawkey, C.M., Horsley, D.T., Keymer, I.F., **Haematology of wild penguins (Sphenisciformes) in the Falkland Islands, *Avian pathology*, 1989 18(3), p.495-502, 20 refs.**

Haematological values were determined in 50 Rockhopper (*Eudyptes crestatus*), 19 Gentoo (*Pygoscelis papua*) and 12 Magellanic (*Spheniscus magellanicus*) penguins from various sites on the Falkland Is. Adult Magellanic penguins had significantly lower haemoglobin

(Hb) levels, packed cell volumes (PCV) and red cell counts (RBC) than adults of the other two species. Hb, PCV and RBC values were also lower in juvenile birds than in adults, and lower in post-moult than in pre-moult adults. Comparison of findings in wild Rockhopper and Gentoo penguins with values obtained from captive birds showed slight but significant differences in Hb and mean cell haemoglobin concentration, and in the relative numbers of heterophils, lymphocytes, monocytes and eosinophils present. (Auth.)

B-43118

Boyd, I.L., Lunn, N.J., Rothery, P., Croxall, J.P., **Age distribution of breeding female antarctic fur seals in relation to changes in population growth rate**, *Canadian journal of zoology*, Oct. 1990 68(10), p.2209-2213, 18 refs.

The age distribution of breeding female antarctic fur seals at Bird I., South Georgia, in 1988 was compared with the age distribution of a sample obtained in 1971-1973. The mean age in 1971-1973 was 7.41 years and in 1988 it was 6.93 years. After correction for age-dependent arrival time at the pupping beach in 1988, the mean age was 6.22, which was significantly lower than in 1971-1973. Indicators of population size suggested that population growth at Bird I. had declined to below 3% annually by 1988 compared with rapid growth (17%) in 1958-1972. Exponential models fitted to the frequency distribution of age-classes greater than age 5 years and corrected for the rate of increase of the population gave adult survival rates of 0.66 and 0.88 for the 1988 and 1971-1973 samples, respectively. The reduced apparent adult survival rate in the 1988 sample was probably caused by emigration brought about by high densities of females on the pupping beaches. There are few signs from this analysis that the fur seal population at South Georgia is close to carrying capacity. (Auth.)

B-43119

Beaucournu Saguez, F., Vernon, P., ***Crozetia seguyi*, sp. n. (Diptera:Simuliidae) for *Cnephia crozetensis* (Womersley, 1937) sensu Séguy (1940), new species from Crozet Islands [*Crozetia seguyi*, n. sp. (Diptera:Simuliidae) pour *Cnephia crozetensis* (Womersley, 1937) Sensu Séguy (1940), espèce nouvelle des Iles Crozet]**, *Société entomologique de France. Annales*, July-Sep. 1990 26(3), p.405-409, In French with English summary. 5 refs.

Until now, the endemic blackflies from Crozet Is. were known as *Crozetia crozetensis* (Womersley, 1937). They are actually a complex of species. In this preliminary study, only the male of *Crozetia seguyi* is described. (Auth.)

B-43120

Serra Tosio, B., Brundin, L., **Redescription of the male *Microzetia mirabilis* Séguy, 1965, an endemic Chironomid midge from the Crozet Islands (Diptera:Chironomidae)** [Redescription du mâle de *Microzetia mirabilis* Séguy, 1965, Chironomide endémique des Isles Crozet (Diptera:Chironomidae)], *Société entomologique de France. Annales*, July-Sep. 1990 26(3), p.411-419, In French with English summary. 8 refs.

The present redescription of the male imago of *Microzetia mirabilis* Séguy, 1965 is based on the incomplete type of the Muséum national d'Histoire naturelle (Paris) and on numerous specimens from Possession I. (Crozet archipelago). (Auth.)

B-43145

Wilkinson, D.M., **Multivariate analysis of the biogeography of the protozoan genus *Nebela* in southern temperate and antarctic zones**, *European journal of protistology*, Oct. 19, 1990 26(2), p.117-121, 19 refs.

Techniques of multivariate data analysis are applied to the data set of Smith and Wilkinson on the distribution of the protozoan testate

amoebae genus *Nebela* in the southern temperate and antarctic zones. The aim was to demonstrate the potential of these techniques in protozoan studies and also to investigate the extent to which the multivariate and previously used simple inspection approaches produced similar results. The results are mainly consistent with the original analysis, and suggest a major role for climate (characterized by mean Jan. temperature) in controlling species richness. It is suggested that the methods of simple inspection and multivariate analysis are complementary. (Auth.)

B-43164

Bester, M.N., **Reproduction in the male sub-antarctic fur seal *Arctocephalus tropicalis***, *Journal of zoology*, Oct. 1990 222(2), p.177-185, 32 refs.

The reproductive tracts of male sub-antarctic fur seals *Arctocephalus tropicalis* (n=123), taken at Gough Island between Nov. 1977 and Oct. 1978, were examined. The presence of spermatozoa in the epididymal tubules showed that all males 4 years old had reached puberty, and the marked slower increase in mean testis weight and baculum length suggested that sexual (social) maturity was approached by 8-year-olds. Full adulthood was attained at 10-11 years of age based on the peak in mean testis and prostate weights, and mean baculum length. Secondary sexual characteristics were only fully developed in males 9 years old. A significant decline in mean testosterone concentration, and in testis, epididymis and prostate weights showed that adult males were reproductively quiescent during winter from May to July when seminiferous and epididymal tubules had lowest mean diameters with no spermatozoa present. Both the mean plasma testosterone concentration and mean testis weight peaked twice during the austral summer. The first peak coincided with the breeding season, and the second peak with the moulting period when adult males were impotent. Photoperiodic cueing might explain this seasonal trend. (Auth.)

B-43165

Williams, T.D., **Annual variation in breeding biology of gentoo penguins, *Pygoscelis papua*, at Bird Island, South Georgia**, *Journal of zoology*, Oct. 1990 222(2), p.247-258, 39 refs.

The breeding biology of the gentoo penguin, *Pygoscelis papua*, was studied over a three-year period (1986-1988) at Bird I., South Georgia, with particular reference to birds of known age or breeding experience. Laying date varied significantly between all three years, being three weeks later in 1987, when the breeding population decreased markedly. Factors involved in the timing of breeding are discussed. Within years egg-laying was highly synchronous: 95% of clutches were initiated in 14.5 days or less. The incubation period was 35 days and the laying interval, between the two eggs, 3.3-3.4 days. Chicks creched when 25-30 days old, and this varied between years, possibly related to food supply and chick growth. Chicks left the colony for the first time between 75 and 85 days of age. The breeding population at Bird I. decreased by 20% and increased by 84% in successive years during the study period. Breeding success (chicks fledged per egg laid) varied between 0.33 and 0.65 within colonies, but for the whole island was very consistent over the three years: 0.45, 0.51 and 0.47. The relationship between age, egg weight, laying date and breeding success is discussed in relation to predation and seasonal food supply. (Auth. mod.)

B-43166

Wilkinson, I.S., Bester, M.N., **Duration of post-weaning fast and local dispersion in the southern elephant seal, *Mirounga leonina*, at Marion Island**, *Journal of zoology*, Dec. 1990 222(4), p.591-600, 16 refs.

Post-weaning behavior of southern elephant seals was studied at Marion I. Duration of fast in both sexes increased in direct proportion to weight at weaning, while it decreased with weaning date in males. Both sexes appear to fast until they have reached a lower

weight 'threshold' of around 70% of weaning weight. Local dispersion after the fast was studied by resighting tagged animals at weekly intervals. Only 460 (7.0%) resights out of 6530 involved a move between sites, representing 378 (16.8%) of the 2246 pups that were tagged. Males moved more frequently between tagging sites and covered greater distances than females. Moves between sites are more frequent and distances travelled are greater in Dec. than Nov. Differences in dispersion patterns between Marion I. and Iles Kerguelen may be caused by differences in coastal configuration. Under-yearlings spent an average of 105.0 days at sea before returning for between 10 and 20 days in the autumn. Weaning weight had no effect on likelihood of hauling out in autumn. Movements between sites during the autumn haulout are infrequent and no fidelity to birth site is evident at this stage. (Auth.)

B-43169

Fanta, E., Lucchiari, P.H., Bacila, M., **Circadian rhythm of oxygen consumption and oxygen levels in the muscle of *Notothenia neglecta* (Pisces, Teleostei), *Comparative biochemistry and physiology*, 1990 96C(1), p.151-155, 35 refs.**

The oxygen consumption of *Notothenia neglecta* (Pisces, Teleostei) was measured during the antarctic summer (16 hr light and 8 hr twilight), in a sealed jar system. Specimens of 917.5 g mean weight and of 34.2 cm mean standard length were used. The oxygen levels in the muscle were continuously recorded by means of an oxygen microelectrode and behavior was observed by direct monitoring. Different times were chosen for the measurements during the 24 hr of the day, at the temperature of 0 C. The oxygen consumption was more or less constant during the morning, with a decrease in the late afternoon, corresponding to the highest point of the oxygen level in the muscle, to a marked decrease in activity. At 8 a.m., another peak in the muscle oxygen level was observed, as well as the highest swimming activity and the highest susceptibility to gradual anoxia. The values of respiratory frequency did not show a marked rhythmical variation. Oxygen consumption, but mainly muscle oxygen levels and swimming activity, seem to have a circadian rhythm, as similar shaped curves repeated at different days and for different individuals. (Auth.)

B-43175

Ishman, S.E., **Modern benthic foraminiferal distribution from the Bellingshausen/Pacific sector of the Antarctic Peninsula, *Antarctic journal of the United States*, 1989 24(5), p.121-123, 12 refs.**

Benthic foraminifera serve as useful proxies to paleoceanography, paleoclimatology, and paleogeography. Their use in polar regions has been restricted, however, due to the limited number of polar ecologic studies. The purpose of this ongoing study has been to develop the ground-truth for Antarctic Peninsula benthic foraminifera to use them effectively as paleoclimatic indicators in downcore studies. This part of the study describes the functions of collection, identification, and species distinction by habitat. The latter process is vividly represented by the species which cling to the Archipelago and Peninsula bays and those which do likewise to the Strait and Marguerite Bays.

B-43179

Taviani, M., Aharon, P., **Assessment of the stable isotope composition of calcareous modern benthic fauna from the Ross Sea, Antarctica, *Antarctic journal of the United States*, 1989 24(5), p.131-132, 9 refs.**

A project has been undertaken to evaluate the stable isotopic composition of calcareous skeletons of modern benthic organisms inhabiting the antarctic waters. Shallow-water benthic organisms belonging to many different phyla have been collected in Terra Nova

Bay during the Third Italian National Expedition (austral summer 1987-1988). Calcareous parts of co-occurring, primarily live-collected foraminifera, bivalves, gastropods, polychaetes, bryozoa, octocorals, echinids, and calcareous algae (Rhodophyta) have been analyzed for their stable oxygen and carbon isotope composition. It appears that these species can be used as reliable paleoenvironmental indicators; under such circumstances, it is important to point out that these, or strictly allied, species are recurrent fossils within the late Tertiary-Quaternary raised deposits and cored ancient sediments along the antarctic continent.

B-43185

Ainley, D.G., Sullivan, C.W., **AMERIEZ 1988: a summary of a winter cruise of the Weddell and Scotia Seas on *Polar Duke*, *Antarctic journal of the United States*, 1989 24(5), p.144-147, 3 refs.**

The project known as Antarctic Marine Ecosystem Research at the Ice-Edge Zone (AMERIEZ) is a multidimensional investigation of the structure and processes of antarctic pelagic communities and the way in which structure and function are affected by the temporal dynamics of pack ice. The pack-ice edge is a major oceanographic feature where biomass and biological productivity are enhanced in the water column. The seasonal advance and retreat of the ice margin, which is an ecological interface between two communities, strongly affects the natural history of most organisms residing in antarctic seas. The program consisted of studies treating the following areas; many of the activities treating the lower trophic levels included studies both in the water column and in the sea ice: physical chemical characteristics of the ice; photosynthetically available irradiance and spectral composition of light; physical chemical structure of the upper water column; nutrient chemistry; bacterioplankton biomass and growth rates; primary production and chlorophyll *a* distribution; phytoplankton microheterotroph biomass, species composition, and activity; hydroacoustic-, trawl-, net-, and bottle-sampling of micronekton biomass and species composition; metabolic rates of macrozooplankton and micronekton; determination by census of biomass and composition of macronekton; food-web structure, including all trophic levels. Participating principal investigators and their disciplines are listed in the table.

B-43189

Cota, G.F., Smith, W.O., Jr., **AMERIEZ 1988: Phytoplankton biomass and productivity in the marginal ice zone of the Weddell-Scotia Sea during austral winter, *Antarctic journal of the United States*, 1989 24(5), p.152-153, 5 refs.**

Distributions of phytoplankton biomass in the upper 150 m were mapped on six transects normal to the ice edge of the Weddell Sea during the AMERIEZ 1988 cruise. The goals of the project were to assess the controls (physical and biological) on phytoplankton biomass and growth, determine the relative importance of the ice algal community and the water-column microplankton, and improve the understanding of the seasonal patterns of ice-edge phytoplankton blooms in the Weddell-Scotia Sea and their contribution to annual carbon budgets of the southern ocean. The results of these six sections suggested that biomass distributions were closely related to hydrographic structure, and that biomass accumulations were largely controlled by physical processes in the marginal ice zone in winter.

B-43190

Lizotte, M.P., Chamberlin, W.S., Reynolds, R.A., Sullivan, C.W., **AMERIEZ 1988: Photobiology of microalgae in the sea ice and water column of the Weddell-Scotia Sea during winter, *Antarctic journal of the United States*, 1989 24(5), p.154-156, 6 refs.**

Studies were conducted as part of the Antarctic Marine Ecosystem Research at the Ice-Edge Zone (AMERIEZ) project during two

cruises in June-Aug. 1988. The object was to investigate the photoadaptive characteristics of microalgae in the ice-edge zone of the Weddell-Scotia Sea in relation to the availability and spectral quality of light in sea-ice and water-column environments. Results suggest that the upper water column was well mixed, and that phytoplankton were vertically mixed faster than they could adapt to the changes in irradiance experienced through the mixed layer. In contrast, microalgae from young ice had higher I_k values than phytoplankton, presumably an adaptation to higher and more constant surface irradiances.

B-43191

Fryxell, G.A., Kang, S.H., Ashworth, T.K., **AMERIEZ 1988 and ODP Leg 119: Antarctic phytoplankton summer and winter stage indicators**, *Antarctic journal of the United States*, 1989 24(5), p.156-157, 8 refs.

In the austral summer of Dec. 1987 to Feb. 1988 the drill ship *JOIDES Resolution* and its service vessel *Maersk Master* conducted the Ocean Drilling Program (ODP) Leg 119 over the Kerguelen Plateau and over the antarctic continental shelf into Prydz Bay. During austral winter June to Aug. 1988, the R/V *Polar Duke* completed two legs into the northern Weddell Sea for AMERIEZ. Quantitative phytoplankton estimations from the water column are being made from both cruises, with interesting implications for seasonal dynamics and allowing a continuation of life history interpretations. Over 40 diatom species were found in Prydz Bay.

B-43192

Garrison, D.L., Buck, K.R., Gowing, M.M., **AMERIEZ 1988: Nano- and microplankton in the ice-edge zone during the austral winter**, *Antarctic journal of the United States*, 1989 24(5), p.158-160, 6 refs.

During the Antarctic Marine Ecosystem Research in the Ice-Edge Zone (AMERIEZ) winter cruise, June 9 to July 5, 1988, planktonic assemblages were sampled in the upper 100 m of the water column along two transects across an ice-edge zone in the Weddell and Scotia Seas region. Plankton biomass ranged from 0.2 to 0.6 g of carbon/sq m. Heterotrophic biomass (flagellates plus ciliates) exceeded autotrophic biomass (diatoms plus flagellates) at most open water stations. The phytoplankton assemblage was comprised of dinoflagellates (an average of 57% of the autotrophic biomass), autotrophic nanoflagellates (30%) and diatoms (13%). The nanoplankton (cells less than 20 microns in equivalent spherical diameter) dominated in all groups except diatoms and comprised an average of 63% of the total autotrophic biomass. Autotrophic biomass increased from ice-covered to open water stations.

B-43193

Gowing, M.M., Garrison, D.L., Buck, K.R., Coale, S.L., **AMERIEZ 1988: Winter protozooplankton from the Weddell and Scotia Seas**, *Antarctic journal of the United States*, 1989 24(5), p.160-162, 5 refs.

As part of the Antarctic Marine Ecosystem Research at the Ice-Edge Zone (AMERIEZ) project, the distributions, abundances, and trophic ecology of heterotrophic protozooplankton ranging from 50 to 300 microns in their longest dimension were studied. Samples were collected along several transects perpendicular to the ice edge from June 9 to Aug. 13, 1988. Ciliates were numerically dominant at most stations and at depths above 190 m, and decreased in importance with increasing depth. Radiolarians were second in abundance and often dominated in the deepest samples. The heliozoan *Sticholanche zancelea* increased in abundance with increasing depth. Foraminiferans and acantharians were present at most depths in low abundances (from less than 1 to 200/cu m), and usually made up 1-10% of the numbers of larger protozooplankton. Mean abundances of total large protozooplankton in ice-covered waters were approximately twice those in open water above 135 m and were similar at 200 m.

B-43194

Hopkins, T.L., Torres, J.J., Lancraft, T.M., Donnelly, J., **AMERIEZ 1988: Aspects of the ecology and physiology of zooplankton and micronekton in the vicinity of a winter ice edge**, *Antarctic journal of the United States*, 1989 24(5), p.163-164, 4 refs.

The community structure and physiology of zooplankton and micronekton were examined in the vicinity of the ice edge in the Scotia-Weddell Sea as part of the AMERIEZ 1988 winter cruise. As is typical for winter in the southern ocean, most of the zooplankton biomass resided below 200 m with little difference noted between open water, ice-edge, and pack-ice habitats. Diel sampling revealed a recurring biomass peak in the upper 100 m at night, resulting from more successful nighttime capture of immature krill stages concentrated in this zone. The dominant species were the small particle-grazing calanoids *Metridia gerlachei*, *Calanus propinquus* and *Calanoides acutus*, which together comprised greater than 75% of the zooplankton biomass in the upper 1,000 m. *Salpa thompsoni* was a minor contributor to winter 1988 collections. Integrated biomass (night) over the upper 1,000 m was only 0.9 g dry weight/sq m.

B-43195

Daly, K.L., Macaulay, M.C., **AMERIEZ 1988: Abundance, distribution, and overwintering strategies of krill in the ice-edge zone**, *Antarctic journal of the United States*, 1989 24(5), p.165-166, 6 refs.

As part of AMERIEZ (Antarctic Marine Ecosystem Research at the Ice-Edge Zone), acoustic, net, and experimental observations were made in the Scotia-Weddell Sea during austral winter to investigate the effect of the marginal ice zone on micronekton. Preliminary results indicate that *Euphausia superba* for the most part were dispersed and in low concentrations. At times, however, swarms of larvae and juvenile and immature adults did occur in the upper 50 m of the water column near the ice edge during day and night. *E. superba* were collected in net samples in all areas; however, mean abundances of krill were an order of magnitude higher near the ice edge than in open water or deep in the pack ice. Furthermore, large concentrations of larvae were observed on the undersurfaces of ice floes. *T. macrura* were collected at almost every station. *E. frigida* were most abundant north of 60S and *E. triacantha* only occurred in the western side of the study area, north of 60S. More than 80% of *E. superba* were collected in the upper 100 m of the water column, while the other euphausiids primarily were found below 100 m.

B-43196

Ainley, D.G., Fraser, W.R., Ribic, C.A., **AMERIEZ 1988: Biological oceanography of apex predators in the Weddell-Scotia Confluence, winter 1988**, *Antarctic journal of the United States*, 1989 24(5), p.166-168, 2 refs.

During both legs of the AMERIEZ winter cruise, the abundance and distribution of apex predators were assessed by conducting strip censuses whenever the ship was underway during daylight. When the ship was on station the diet of seabirds was assessed by collecting specimens or pumping birds' stomachs. Diet analysis indicated a similar diet by all species. The most important prey were lanternfish (Myctophidae), which rise to the surface during night. Of secondary importance were krill and pelagic amphipods. Census results indicated a close correspondence between both pinnipeds and birds, and in turn the close correspondence of these organisms with the presence of pack ice.

B-43200

Karentz, D., **Report on studies related to the ecological implications of ozone depletion on the antarctic environment**, *Antarctic journal of the United States*, 1989 24(5), p.175-176, 4 refs. For related article, see B-42826.

The project described here examined several aspects of ultraviolet radiation related to the photobiology of antarctic organisms. Field studies and collections were made in the vicinity of Palmer Station at Arthur Harbor. Results have demonstrated that biologically significant fluxes of UV-B radiation occur down to 10 m and can reach to 30 m in coastal waters during the ozone hole. Photoreactivation may be the predominant pathway for DNA repair in diatoms and observed differences in cell division rates support previous conclusions that the major effect (if any) of increased UV-B in the environment may be changes in the taxonomic structure of plankton communities. It also appears that many antarctic species are able to synthesize compounds that act as natural "sunscreens," providing protection from UV-B exposure.

B-43201

Holm-Hansen, O., Mitchell, B.G., Vernet, M., **Ultraviolet radiation in antarctic waters: Effect on rates of primary production**, *Antarctic journal of the United States*, 1989 24(5), p.177-178, 5 refs.

Ultraviolet studies are described for determining the effect of solar ultraviolet radiation on the rate of photosynthesis by antarctic marine phytoplankton. The *in situ* experiments show that incident solar ultraviolet radiation in the Antarctic significantly depresses photosynthetic rates in the upper 10-15 m of the water column and that the spectral region between 305 to 350 nanometers is responsible for approximately 75% of the overall inhibitory effect.

B-43202

Mitchell, B.G., Vernet, M., Holm-Hansen, O., **Ultraviolet light attenuation in antarctic waters in relation to particulate absorption and photosynthesis**, *Antarctic journal of the United States*, 1989 24(5), p.179-181, 9 refs.

Variability in the spectral absorption of marine particulates, penetration of ultraviolet radiation into the water column, and the spectral aspects of ultraviolet photoinhibition of phytoplankton were studied in the vicinity of Palmer Station. Strong absorption in the ultraviolet from 320-330 nm is documented for marine particulates. Below this region of the solar energy spectrum, absolute energy levels drop off very dramatically. Only wavelengths shorter than about 320 nm will be significantly enhanced due to ozone depletion. Results on the spectral response of ultraviolet inhibition of photosynthesis from natural solar energy indicate that wavelengths from 320-335 nm provide the greatest absolute photoinhibitory effect.

B-43203

Vernet, M., Mitchell, B.G., Holm-Hansen, O., **Ultraviolet radiation in antarctic waters: Response of phytoplankton pigments**, *Antarctic journal of the United States*, 1989 24(5), p.181-183, 11 refs.

The objective of this study was to document the rate and extent of photoadaptation by antarctic phytoplankton, as evidenced by the synthesis of "screening" pigments which absorb ultraviolet radiation and may protect sensitive chromophores from ultraviolet radiation which would otherwise result in cellular damage. It is concluded that the phytoplankton show photoadaptive characteristics which include both the synthesis of potentially protective "screening" pigments, which may dissipate the energy of absorbed radiation, and the capability to utilize some of the ultraviolet radiation in the energy-requiring reactions of photosynthesis through photosynthetic pigments that absorb below 400 nm.

B-43204

Smith, G.A., Ringelberg, D.B., White, D.C., Marinovic, B.B., **Arthur Harbor sediment fluxes for a spring bloom: Measurements of particulate organic carbon and total lipid**, *Antarctic journal of the United States*, 1989 24(5), p.184-185, 8 refs.

Sediment fluxes of particulate organic carbon and the lipid component of this particulate organic carbon were determined for an Arthur Harbor site for the austral summer of 1988-1989. Preliminary rates of sediment fluxes indicated substantial fluxes of 4.2 g of particulate organic carbon per sq m per day to the sediments. Of the material collected, lipid made up approximately 1.8% (71 mg per sq m per day) of the total particulate organic carbon. Comparisons with various temperate, tropical, and two antarctic sites indicate that rates for Arthur Harbor are among the highest reported for particulate organic carbon; however, lipid percentages were lower.

B-43205

Letelier, R.M., Karl, D.M., **Phycoerythrin-containing cyanobacteria in surface waters of the Drake Passage during February 1987**, *Antarctic journal of the United States*, 1989 24(5), p.185-188, 10 refs.

Data are presented on the distribution and abundance of phycoerythrin-containing cyanobacteria in the surface waters of the Drake Passage, based on samples collected during the 1986-1987 austral summer. Samples were collected from the R/V *Polar Duke* along a transect from the South Shetland Is. to the Beagle Channel, on Feb. 4-7, 1987. The abundance of cyanobacteria in this study was positively correlated with temperature, not only for samples collected along the Drake Passage portion of the transect, where the surface water temperature increased northward, but also for those from the Beagle Channel portion, when temperature declined. Also observed was a significant positive linear correlation between the abundance of cyanobacteria and total bacteria along the transect. These results suggest that the two independent prokaryotic assemblages may be closely coupled in space, and perhaps controlled by similar environmental variables.

B-43206

Iturriaga, R., Sullivan, C.W., **Spectral light absorption characteristics of individual sea-ice microalgae from McMurdo Sound, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.188-190, 8 refs.

A microphotometric technique was applied to study the spectral absorption characteristics of individual sea-ice microalgae and their taxonomic identification at three different sites in McMurdo Sound during Dec. of 1986: Erebus Ice Tongue, Granite Harbor, and Hut Point. Individual diatoms appear to have species-specific absorption spectral features. In addition, spectral variability within the clones of colonial algal species, such as *Nitzschia kerguelensis* or *Amphiprora kufferathii*, were measured. A figure shows a family of spectra derived from a clonal chain of 10 cells of *N. kerguelensis*. Preliminary microphotometric measurements on individual cells indicate that optical properties of ice algae are subject to variability on several scales. Statistical tests are being designed to rigorously define the variability at the level of clones of one species, among different species from the same environment, and among cells of the same species from different environments.

B-43207

Aiken, G.R., McKnight, D.M., Harnish, R.A., **Chemical characteristics of aquatic fulvic acid isolated from Lake Fryxell, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.190-192, 7 refs.

Lake Fryxell in the Taylor Valley was chosen for study because it is one of the more productive Dry Valley lakes. Lake Fryxell is amictic with a highly stable water column due to the year round ice cover. Despite the low light intensities caused by the 4.5 m thick ice cover, abundant algal populations develop in the oxic zone of the water column above the 9.5 m depth, as demonstrated by *in vivo* fluorescence data, which is an indirect measure of phytoplankton abundance. Aquatic fulvic acid is a major fraction of the organic

material in the lake, accounting for 40% of the dissolved organic carbon. The similarity in the chemical composition of the fulvic acid samples, and the similarity between the dissolved organic carbon and specific conductance profiles, suggest that a major source of dissolved organic carbon in Lake Fryxell is the degradation of particulate organic carbon derived from algae and bacteria in the sediments or bottom waters of the lake, with subsequent diffusion of the more refractory components into the water column.

B-43215

Broady, P.A., Ohtani, S., **Joint New Zealand-Japanese studies on the taxonomy of terrestrial antarctic algae**, *New Zealand antarctic record*, 1990 10(3), p.22-27, 14 refs.

Preliminary identifications were made on a total of 38 strains of algae isolated from ice-free areas in Lützow-Holm Bay. These comprised 26 species of which six were Cyanobacteria, 18 Chlorophyta and two Xanthophyceae. Preliminary identifications and comparison with isolates from other antarctic regions are tabulated. Representative species are illustrated. Sixteen species (61%) were morphologically either very similar or identical to strains from other antarctic regions. Strains of six species have yet to be critically compared with the latter. Two species, *Actinotaenium cucurbita* and *Kentrosphaera* sp., have been observed in sample material from regions other than Lützow-Holm Bay, but have not been isolated previously into unialgal culture. The two remaining species, *Macrochloris multinucleatum* and *Myrmecia bisecta* are thought to be new records for continental Antarctica.

B-43216

Meyer-Rochow, V.B., **Case of abnormal eye enlargement in the antarctic fish *Pagothenia borchgrevinki* (Pisces, Teleostei, Nototheniidae)**, *New Zealand antarctic record*, 1990 10(3), p.28-31, 9 refs.

An abnormality seen only once in approximately 1000 *Pagothenia borchgrevinki* fish from the Ross Sea is described as possibly representing the 'magnoculus' condition known from common goldfish and thought to be caused by a single recessive gene. Advantages and disadvantages for fish with abnormally enlarged, but non-diseased eyes are briefly discussed from a visual physiological viewpoint. It is concluded that although eye enlargement may seem advantageous when examined entirely from an optical/visual physiological view, there are constraints like increased drag and resistance during swimming, elevated change of injury or disease, and greater recognizability to predator and prey alike, which are likely to counteract and balance any gain made in the optical/visual domain. (Auth.)

B-43218

Radtke, R.L., Kellermann, A.K., Shafer, D.J., Ruzicka, J.J., **Early life histories of antarctic fishes**, *Antarctic journal of the United States*, 1989 24(5), p.194-196, 8 refs.

To validate the periodicity of otolith deposition zones, larvae of the notothenioid fish *Notothenia neglecta* were reared from field-caught eggs on board the icebreaking research vessel R/V *Polarstern*. Eggs were collected near Elephant I. and in the northern Weddell Sea in Oct. 1988. To investigate hatching periodicity and early life history dynamics from field-caught larvae of antarctic fishes, otolith microstructure was analyzed in larvae of six species of icefishes, Channichthyidae, caught during the expeditions of R/V *Polarstern* in Bransfield Strait and adjacent waters in spring 1987 and 1988. Additional larval samples of *N. gibberifrons*, *C. rastrispinosus*, *N. larseni*, and *K. anderssoni* were obtained in limited quantity for study during a Jan. 1989 cruise aboard the *Surveyor*. Otolith microstructure may reveal *in situ* information on the temporal and spatial variability of yolk absorption and growth rates.

B-43219

Detrich, H.W., III, Himes, R.H., **Treadmilling of antarctic fish microtubules at low temperatures**, *Antarctic journal of the United States*, 1989 24(5), p.196-197, 7 refs.

The initial rates of tubulin uptake into *Notothenia gibberifrons* microtubules at 3 temperatures, and the length distributions for the same 3 microtubule populations, determined by negative-stain electron microscopy, are shown. The greatest rate of tubulin incorporation occurred at 5 C, the temperature at which the mean microtubule length was greatest and the microtubule number concentration was smallest. The linear uptake of labeled tubulin is consistent with subunit incorporation by a treadmilling mechanism. When examined at a temperature of 5 C, near the physiological range of the antarctic fishes, the MAP (microtubule-associated protein)-free microtubules of *N. gibberifrons* treadmill at a rate intermediate between those reported for MAP-free and MAP-rich mammalian microtubules at 30-37 C. The apparent conservation of microtubule treadmilling by these cold-adapted fishes suggests that subunit flux may play an important functional role in microtubule-dependent processes.

B-43220

Sidell, B.D., Crockett, E.L., Londraville, R.L., Lund, E., **Metabolic and ultrastructural characteristics of oxidative muscles from antarctic fishes**, *Antarctic journal of the United States*, 1989 24(5), p.198-200, 8 refs.

In vitro studies are discussed of fatty acyl compositions of neutral lipid stores in antarctic fishes *Trematomus newnesi* and *Notothenia gibberifrons* samples frozen at Palmer Station. Also examined were the subcellular structures of oxidative muscles of the two species to identify any aspects of ultrastructural organization that might be adaptive to normal function at severely cold body temperature. Results to date confirm that the preferentially metabolized fatty acyl substrates identified in earlier experiments represent a significant fraction of the total blood-borne pool in both species. Because of the exceptionally high content of long-chain polyunsaturated fatty acids in the lipid stores of antarctic species, and the poor ability of the mitochondrial system to metabolize these substrates, it is believed that the hepatic peroxisomal pathway may serve an important function in modifying these fatty acids to a form accessible to mitochondria.

B-43221

Eppey, Z.A., Rubega, M.A., Tasker, M.L., **Reproductive success of kelp gulls and south polar skuas at Palmer Station, Antarctic Peninsula, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.200-202, 14 refs.

As part of studies on evolutionary adaptation of antarctic birds to reproduction in the cold, the reproductive parameters of kelp gulls *Larus dominicanus* and south polar skuas *Catharacta maccormicki*, obtained at Palmer Station in 1988-1989, are discussed and presented in a table. Although the reproductive parameters of the skuas in that period were within normal values, the population suffered a complete reproductive failure which coincided with the occurrence of an oil spill near Palmer Station in Jan. 1989. It is suggested that exposure to oil caused a short-term disruption of normal parental attendance behavior. This exposed the young to fatal intraspecific aggression, the only cause of mortality observed after the oil spill.

B-43222

Elliot, D.H., **Bird observations at Seymour and Cockburn Islands**, *Antarctic journal of the United States*, 1989 24(5), p.202-203, 2 refs.

During the course of geologic fieldwork on Seymour and Cockburn Islands in 1986-1987 and 1989, observations were made on the occurrence of nesting sites of various birds. A short note on the nesting species, and a sketch map illustrating location of nesting sites, are presented.

B-43223

Kooyman, G.L., **Physiology of diving in emperor penguins and Weddell seals**, *Antarctic journal of the United States*, 1989 24(5), p.204, 1 ref.

Metabolic rates of Weddell seals and emperor penguins were obtained by measurement of oxygen gas concentration changes under a plexiglass dome sealed to the water surface. The seals dived readily under the experimental conditions. Metabolic studies of the seals were completed. The preliminary analyses show that the seal's metabolic rate was low, not much more than 50 to 100% above the predicted resting metabolic rate, for all diving activities. A thermistor placed in the propulsive muscle measured muscle temperature. Preliminary results indicate little temperature change during the dive. In the emperor penguin studies, similar physiological variables to those of the Weddell seal were measured. Preliminary analysis indicates that heart rates during 4- to 6-minute dives were only slightly lower than resting heart rates. Also obtained during these studies were muscle temperature, cardiac output at rest, and swim velocity.

B-43224

Wartzok, D., Elsner, R., Mimken, G., Davis, R., **Under-ice movements of Weddell seals**, *Antarctic journal of the United States*, 1989 24(5), p.205-206, 2 refs.

Weddell seals (*Leptonychotes weddelli*) have a circumpolar distribution in the fast ice of Antarctica. The fast ice is attached to the land so breathing holes through it remain fixed in location both absolutely and relative to any permanent ice features. The seals' ability to swim over distances of several kilometers and to depths of 600 m under this ice cover was studied. Results show that the sensory hierarchy used in finding new breathing holes in the ice is the same as that employed by ringed seals, with vision being most important and used whenever possible, and audition being used when vision is limited. Distances to remote acoustic stimuli appeared to be determined by ranging prior to swimming toward the stimuli. The under-ice tracking system can be used in detailed investigations of many aspects of seal ecology and behavior.

B-43250

Oppenheim, D.R., Greenwood, R., **Epiphytic diatoms in two freshwater maritime antarctic lakes**, *Freshwater biology*, Oct. 1990 24(2), p.303-314, Refs. p.311-312.

An ecological study of two small maritime lakes on Signy I. was undertaken from Jan. 1986 to Mar. 1987. Analysis of diatom counts from the lakes provided examples of oligotrophic and mesotrophic ecosystems. A diverse community of 104 epiphytic taxa was identified. Twenty-eight taxa had a percentage abundance greater than 1% in both lakes. Distinctive dominant taxa were identified from each lake. Differences in the diatom assemblages between the two lakes were found. Clear separations of sites and species were evident between the lakes, and accounted for the greatest percentage variance. Species composition was correlated to concentrations of nitrogen and phosphorus, but the total variance accounted for by the four physical and chemical factors measured was low (24%). (Auth. mod.)

B-43282

Peter, H.U., Kaiser, M., Gebauer, A., **Ecological and morphological investigations on South Polar Skuas (*Catharacta maccormicki*) and Brown Skuas (*Catharacta skua lonnbergi*) on Fildes Peninsula, King George Island, South Shetland Islands**, *Zoologische Jahrbücher. Abteilung für systematik Ökologie und Geographie der Tiere*, 1990 117(2), p.201-218, Refs. p.216-218.

Measurements on adults show that *Catharacta maccormicki* (Cm) is significantly smaller than *C. skua lonnbergi* (Csl). It is possible to distinguish nearly all breeding birds by stepwise discriminant analysis. There are also differences in nest sites and egg parameters. In the

first weeks the growth of wing, tenth primary, tail and culmen is more rapid in chicks of Cm than Csl, whereas tarsus growth and mass increase are absolutely faster in Csl than in Cm. In 1984/85 the number of eggs per breeding pair (1.92-2.00) and the overall breeding success (0.95-1.03) are similar for the two species and mixed pairs (mp). The main food sources for breeding pairs (n=154) are penguins and their eggs (Csl 69%, Cm 12%, mp 0%) and fish (Csl 10%, Cm 78%, mp 100%). Most breeding territories of the dominant Csl were found near the penguin colonies and the stations, whereas Cm breeds in the remaining areas. The distance from the coast is longer than for Csl. The Cm egg-laying date covered a wider range (Nov. 12-Jan. 15) than those of Csl (Nov. 23-Dec. 30). (Auth.)

B-43283

Coleman, C.O., **Two new antarctic species of the genus *Epimeria* (Crustacea: Amphipoda: Paramphithoidae), with description of juveniles**, *Royal Society of New Zealand. Journal*, June 1990 20(2), p.151-178, 13 refs.

Epimeria pulchra n.sp. and *Epimeria oxycarinata* n.sp. are described from the Antarctic. These species seem to be closely related to *Epimeria grandirostris* (Chevreux, 1912), which is redescribed in this paper. The juveniles of the new species are described and are considerably different from the adults. There are no dorsal carinae, and no armature on pereonites and pleonites. The reduction of acute body processes in the juveniles is interpreted as adaptation to early life in the marsupium. A smooth body is considered to be a plesiomorphic feature. (Auth.)

B-43305

Williams, T.D., Rothery, P., **Factors affecting variation in foraging and activity patterns of gentoo penguins (*Pygoscelis papua*) during the breeding season at Bird Island, South Georgia**, *Journal of applied ecology*, Dec. 1990 27(3), p.1042-1054, 24 refs.

Radio-telemetry was used to study gentoo penguins, throughout the breeding season, to assess variation in foraging effort. Except during chick-brooding, more than 80% of foraging trips consisted of birds departing early in the morning (75% before 07.00 h, local time) and arriving back in the afternoon; 96% of all trips were completed in the same day. During brooding, 45% of all trips were started after 08.00 h, compared to only 6%, 10% and 12% for the pre-breeding, incubation and creche periods. Only 4% of all trips were overnight, all during chick-rearing, but these accounted for about one-third of the total variation in trip duration. Mean trip duration varied significantly between breeding periods, being shortest during brooding (6.96 h) and longest during incubation (10.5 h). Foraging trip frequency and time spent at sea increased throughout the season, being greatest during chick-rearing. Trip duration did not vary significantly with sex or brood size, but decreased with departure time for all breeding periods. Trip duration increased with chick age throughout chick-rearing. Differences between individual birds accounted for 9-13% of total variation in trip duration. The implications of these results as an environmental monitoring parameter are discussed, and examples of suitable sampling protocols suggested. (Auth.)

B-43311

Boczar, B.A., Palmisano, A.C., **Photosynthetic pigments and pigment-proteins in natural populations of antarctic sea-ice diatoms**, *Phycologia*, Dec. 1990 29(4), p.470-477, 29 refs.

Pigment analyses of natural populations of sea-ice diatoms in Antarctica showed a range of chlorophyll *a:c* molar ratios of 1.85-3.83 and carotenoid (fucoxanthin): chlorophyll *a* molar ratios of 1.52-2.57. To understand the structural organization of pigments in these low light-adapted populations, the photosynthetic apparatus of a monospecific natural population of the antarctic sea ice diatom, *Nitzschia*

stellata Manguin (Bacillariophyta), was investigated. Three chlorophyll-protein complexes were isolated from the thylakoid membranes of this diatom. Spectral and pigment analyses revealed that, while all three complexes possessed chlorophyll *a* and fucoxanthin, chlorophyll *c* was found only in Complexes I and II. Complex III contained fucoxanthin and 53% of the total chlorophyll *a*; this complex contained polypeptides in the 18.5 kDa range. These results are in contrast with those previously reported for studies of temperate diatoms. (Auth. mod.)

B-43312

Rodhouse, P.G., Yeatman, J., **Redescription of *Martialia hyadesi* Rochebrune and Mabile, 1889 (Mollusca: Cephalopoda) from the southern ocean, *British Museum (Natural History). Bulletin, Zoology*, Oct. 25, 1990 56(2), p.135-143, Refs. p.141-142.**

Martialia hyadesi Rochebrune & Mabile, 1889 is redescribed from material obtained aboard commercial squid jigging vessels at the Antarctic Polar Frontal Zone, in the vicinity of South Georgia, and on the Patagonian Shelf. The new material confirms the position of the species in the sub-family Todarodinae and indicates a closer affinity with the genus *Todarodes* than *Nototodarus*. Distribution is related to the cool, temperate waters of the southern ocean and Antarctic Polar Frontal Zone. It is known to occur in the South Atlantic and western Pacific sectors of the southern ocean. (Auth.)

B-43313

Fukunaga, N., Russell, N.J., **Membrane lipid composition and glucose uptake in two psychrotolerant bacteria from Antarctica, *Journal of general microbiology*, Sep. 1990 136(9), p.1669-1673, 23 refs.**

The thermal responses of membrane lipid composition and function in two bacterial species isolated recently from Heywood Lake sediment have been investigated. Both isolates are Gram-negative psychrotolerant (psychrotrophic) species growing well at 0 and 25 C, but having very different optimum growth temperatures, of 9.7 C for strain CR3/F/w/1/15 and 20.9 C for strain CR3/F/w/2/10. The acyl lipids in strain 1/15 contain predominantly branched-chain fatty acids, mainly anteiso-15:0. The fatty acid composition and its response to temperature depends on the culture medium used. The acyl lipids of strain 2/10 contain 16:0 and 16:1 as the major fatty acids, particularly in rich medium, when they comprise >90% of the total. When the bacteria were grown in rich or poor medium at 5 C the strain with more 'psychrophilic' characteristics (1/15) took up glucose at a faster rate than did the strain with more 'psychrotrophic' characteristics (2/10), whereas when they were grown at 20 C in either medium the rate of glucose uptake by strain 2/10 was generally faster than that of strain 1/15. (Auth. mod.)

B-43318

Andriiashev, A.P., **Remarks on the taxonomic status of the antarctic species *Paraliparis edentatus* (Liparididae) and description of a new genus, *Journal of ichthyology*, 1990 30(2), p.60-66, Translated from Voprosy ikhtiologii. 7 refs.**

A description is given of a new genus, *Edentoliparis* gen. n., which differs from *Paraliparis* in the total absence of jaw teeth and pharyngeal teeth and in the different arrangement of the radials of the pectoral girdle (1+0+0+1=2). The only species of this genus, *E. terrenovae* from the Weddell Sea, is redescribed on the basis of new information. (Auth. mod.)

B-43319

Balushkin, A.V., Voskoboinikova, O.S., **New family, Bathylutichthyidae (Cottoidei, Scorpaeniformes), for the deepwater fish *Bathylutichthys taranetzi* gen. et sp. nov. from South Georgia Island (Antarctica), *Journal of ichthyology*, 1990 30(2), p.67-75, Translated from Voprosy ikhtiologii. 18 refs.**

A description is given of a new family, Bathylutichthyidae fam. n. (Cottoidei, Scorpaeniformes), for *Bathylutichthys taranetzi* gen. et sp. n. on the basis of external structural characteristics, and characteristics of the paired fins, the axial skeleton, and the seismosensory system. The holotype of the new species was caught on the Northeastern Georgian Rise at a depth of 1650 m, 170 miles from South Georgia. (Auth.)

B-43320

Oven, L.S., Konstantinova, M.P., Shevchenko, N.F., **Aspects of reproduction and feeding of Myctophids (Myctophidae) in the southwest Atlantic, *Journal of ichthyology*, 1990 30(2), p.115-127, Translated from Voprosy ikhtiologii. Refs. p.125-127.**

Results are discussed from research on the reproduction and feeding of three myctophid species from the southwestern Atlantic: *Proto-myctophum choriodon* from the region of the Argentinian depression, and *Electrona carlsbergi* and *Gymnoscopelus nicholsi* from the Scotia Sea. The latter two species are fishes with a notal type of reproductive range, collected in the Scotia Sea and in the region of the antarctic depression in the years 1979-1985. *E. carlsbergi* was found in a post-spawning condition in the summer, with ovaries in maturity stage VI-II. *G. nicholsi* is represented in the material exclusively by juveniles, 7.0-15.2 cm long, with the gonads in maturity stage II. Information is given on the diet of the myctophid species investigated. (Auth. mod.)

B-43341

Delille, D., **Seasonal changes of subantarctic heterotrophic bacterioplankton, *Archiv für Hydrobiologie*, Sep. 1990 119(3), p.267-277, 40 refs.**

During a two-year period, systematic observations of the heterotrophic bacterial population were recorded from a nearshore seawater station in the Kerguelen Archipelago. A weekly survey including physiochemical measurements (temperature and particulate organic matter), total bacterial counts (AODC) and culturable bacteria (MPN on ZoBell medium) determinations was conducted. Potential heterotrophic bacterial activities were estimated by C-14 glucose and C-14 glutamic acid uptake measurements. The bacterial community structure was investigated by carrying out 29 morphological and biochemical tests on 1579 isolated strains. Quantitative data were treated by principal component analysis. Qualitative data were analyzed by a numerical taxonomic technique. The results suggest a close coupling between bacterial heterotrophic microflora and trophic resources. All periods of organic enrichment of the coastal seawater studied led to significant increases of both bacterial number and their activity. Although nonfermentative Gram-negative rods were always dominant, the existence of a succession of populations during bacterial growth resulting from periodical organic enrichments is clearly demonstrated. The possible presence of degenerative forms of Gram-negative rods is discussed. (Auth.)

B-43342

Peng, T.H., Broecker, W.S., **Dynamical limitations on the antarctic iron fertilization strategy, *Nature*, Jan. 17, 1991 349(6306), p.227-229, 14 refs.**

An ingenious means has been proposed by which the rise in atmospheric CO₂ content generated by the burning of fossil fuels and

deforestation might be partially compensated. The idea is that plant production in the nutrient-rich surface waters of the Antarctic could be stimulated by the addition of dissolved iron, thereby reducing the CO₂ partial pressure in these waters and allowing CO₂ to flow from the atmosphere into the Antarctic Ocean. A box model calibrated with transient tracer data has been used to examine the dynamical aspects of this proposal, and shows that after 100 years of totally successful fertilization the CO₂ content of the atmosphere would be lowered by only 10% below what it would have been in the absence of fertilization. So if after 100 years the CO₂ content of the atmosphere were 500 *microatm* without fertilization, it would be between 425 and 475 *microatm* with full fertilization. In other words, if the model calibration is correct, even if iron fertilization worked perfectly it would not significantly reduce the atmospheric CO₂ content. (Auth.)

B-43343

Watkins, J.L., Morris, D.J., Ricketts, C., Murray, A.W.A., **Sampling biological characteristics of krill: effect of heterogeneous nature of swarms**, *Marine biology*, Dec. 1990 107(3), p.409-415, 24 refs.

An effect of the very patchy distribution of antarctic krill in various forms of aggregation is that a single swarm may not provide an unbiased estimate of population parameters such as mean length of krill in the local area. The authors analyze the number of samples required to estimate the characteristics of a local population as precisely as if there were no differences between krill swarms in terms of their biological composition. Krill were intensively sampled over different spatial and temporal scales around South Georgia in 1981 and 1982, and in the Bransfield Strait in 1985. These varied from replicate hauls at a single station over 24 h and repeat sampling in restricted areas over periods of 6 to 14 d, to regional surveys around South Georgia and in the Bransfield Strait. Various biological characteristics were measured such as length, maturity, moult stage and feeding state. Depending upon the biological characteristic examined and the area covered by the sampling program, the number of samples needed to obtain the same degree of precision as would be found in the absence of heterogeneity varied from 3 to >80 samples. This has important implications for the design of a net-sampling program for monitoring krill populations. (Auth.)

B-43351

Koubbi, P., Duhamel, G., Camus, P., **Early life stages of Notothenioidei from the Kerguelen Islands**, *Cybium*, 1990 14(3), p.225-250, With French summary. 39 refs.

Morphology, meristics and pigmentation have been used in combination with knowledge of adult reproduction and habitat to identify larvae of Notothenioidei from the Kerguelen Is. The larvae have been collected regularly with plankton since 1986. Eleven species belonging to this sub-order occur in the Indian sector of the southern ocean. Most of the descriptions of larvae are original and include seven species of Nototheniidae, two species of Channichthyidae and one of Harpagiferidae. The features observed on the larvae reinforce the distinctions between the genera and sub-genera of the Nototheniidae suggested by an earlier investigator. (Auth.)

B-43352

Tankevich, P.V., **Growth, age, and natural mortality of *Notothenia rossii rossii* in the Kerguelen Islands area**, *Cybium*, 1990 14(3), p.269-276, With French summary. 20 refs.

Dynamics of age-length structure of the Kerguelen Is. population of *Notothenia rossii rossii* is presented on the basis of data available for the 1970-1984 period. Growth rate, calculated by scales reading for the beginning of exploitation and later, when the structure of fish population had changed as a result of exploitation, is similar in values when compared. Quantitative estimates of growth parameters were

obtained using von Bertalanffy's equations and agree generally with data of other authors. The natural mortality coefficient for the Kerguelen population of *Notothenia rossii* was determined by applying three independent methods. (Auth.)

B-43353

Hoggarth, D.D., **Effects of parasitism by the rhizocephalan, *Briarosaccus callosus* Boschma on the lithodid crab *Paralomis granulosa* (Jacquinot) in the Falkland Islands**, *Crustaceana*, Sep. 1990 59(2), p.156-170, With French summary. 26 refs.

The Rhizocephalan parasite *Briarosaccus callosus* has been observed infesting a stock of Lithodidae *Paralomis granulosa* from the Falkland Is. with a frequency of less than 1%. Infestation is detected through scarring or the presence of the parasite's reproductive sac or "externa". Crabs with externae are significantly more frequent and males of this category are of small size. Castration of hosts of both sexes by the parasite has been observed both during and after the infestation period. All parasitized females with externae or scars were non-ovigerous. Infested males did not attain morphological maturity as noted by relative claw size. For any given size, males with externae had claws smaller than those of juvenile males. As a result of parasitic feminization, relative claw dimensions of parasitized males were the same as those of unhurt females. After loss of the parasite, scarred males regain claw dimensions similar to those of juvenile males, or in some cases achieve claw sizes which normally occur at maturity. (Auth.)

B-43355

Bergstrom, D.M., Smith, V.R., **Alien vascular flora of Marion and Prince Edward Islands: new species, present distribution and status**, *Antarctic science*, Dec. 1990 2(4), p.301-308, 17 refs.

The presence and distribution of alien plant species on subantarctic Marion and Prince Edward Islands is reviewed and updated. This study documents the finding of a well established population of *Cerastium fontanum* on Prince Edward I. An additional taxon, *Senecio* sp., is recorded in association with a reoccurrence of *Plantago lanceolata* on Marion I. Propagules of both these taxa have recently been dispersed to the island in building material imported from South Africa. The distribution of *Agrostis stolonifera* and *Sagina apetala* on Marion I. increased markedly between 1981 and 1989. (Auth.)

B-43356

Bester, M.N., Bartlett, P.A., **Attendance behaviour of antarctic and subantarctic fur seal females at Marion Island**, *Antarctic science*, Dec. 1990 2(4), p.309-312, 18 refs.

The female attendance behavior of antarctic fur seals (*Arctocephalus gazella*) and subantarctic fur seals (*A. tropicalis*), which breed sympatrically on Marion I., was investigated. Over the same period after the breeding season, the mean duration of feeding trips to sea, and percentage of time spent at sea, did not differ significantly between lactating females of the two species. The difference in mean duration of shore visits was significant, and the longer onshore attendance of *A. tropicalis* probably related to the lower demand by their pups which grow at a slower rate. The subpolar maternal adaptations of *A. gazella* were unchanged under the more temperate environment at Marion I., and it remains to be established unequivocally whether conditions there are limiting to the species. (Auth.)

B-43357

Smith, H.G., Hughes, J., Moore, S.J., **Growth of antarctic and temperate terrestrial Protozoa under fluctuating temperature regimes**, *Antarctic science*, Dec. 1990 2(4), p.313-320, Refs. p.319-320.

Population growth rates of antarctic and temperate isolates of the microflagellate *Heteromita globosa* Stein and of the ciliate *Colpoda cucullus* Müller were determined during incubation both under constant 3.5 and 8.0 C, and under temperature regimes fluctuating on 24-hour cycles, between 0 and 15 C, to simulate antarctic microclimates. Fluctuating temperatures did not inhibit growth. No growth of *Colpoda* occurred at 3.5 C. It is suggested that successful growth in nature depends upon the microclimate providing sufficient degree-hours per day above encystment/excystment threshold temperature (+1.5 C for *Heteromita*, about +4 C for *Colpoda*). The minimum number of degree-hours above threshold needed for growth of *Colpoda* is estimated to lie between 48 and 96. These data are consistent with the recorded presence of *Colpoda* spp. in the subantarctic and rarely in the continental Antarctic, and their absence from the maritime Antarctic. (Auth. mod.)

B-43376

Robertson, G., **Kidson Island: a breeding site for antarctic fulmars**, *Polar record*, Jan. 1991 27(160), p.61, 1 ref.

During Jan. 1989, a breeding population of antarctic fulmars *Fulmarus glacioides* was located at Kidson I., a steep-sided circular rock rising approximately 75 m above sea level about 100 km west of Mawson Station. Antarctic fulmars nest along the entire northern, western and southern side of the island. The population was estimated to be at least 2000 breeding pairs.

B-43379

Greene, C.H., Wiebe, P.H., McClatchie, S., Stanton, T.K., **Acoustic estimates of antarctic krill**, *Nature*, Jan. 10, 1991 349(6305), p.110, 5 refs.

Everson *et al.* discussed the implications of new measurements of target strength for estimating the abundance of krill in the southern ocean (see 18B-42020). Their conclusions were first, that previously used equations relating target strength to physical size of these animals were greatly in error and second, that the use of these equations has resulted in gross underestimates of krill abundance in the southern ocean. As krill provides the basis of a large fishery and is the main component of the diet of many marine predators, accurate estimates are essential for management of this resource. Recently collected data covering a broad size range of crustacean zooplankton and micronekton verify and elaborate the findings of Everson *et al.* New target-strength-by-size relationships over the full size range of krill at the acoustical frequencies commonly used in field studies are presented. (Auth.)

B-43381

Clarke, A., **Faecal egestion and ammonia excretion in the antarctic limpet *Nacella concinna* (Strebel, 1908)**, *Journal of experimental marine biology and ecology*, 1990 138(3), p.227-246, 51 refs.

Limpets were sampled from nearby shallow waters at Signy I. and faecal egestion measured over the following 4 days. The mean faecal egestion rate (dry mass) for a limpet of 250 mg dry mass was 0.91 mg/h, comparable with rates measured in grazing molluscs from warmer waters. The mass exponent (the slope of the regression of log rate on log mass) was 0.94 for faecal egestion measured as dry mass, and 0.85 for faecal organic content; faecal ash content increased with limpet size. Assuming absorption efficiencies similar to those reported for other grazing gastropods, these data indicate typical energy intakes in free-living limpets of 2-3% body mass/day during summer. The exponent relating energy intake (absorption) to limpet dry mass was 0.85. Ammonia excretion was measured on freshly sampled limpets which had been allowed to recover from handling stress for approx. 12 h. The mean ammonia excretion rate for a limpet of 250 mg dry mass was 162 ng-at N/h; the mass exponent was 0.82. Comparison with published data for oxygen consumption suggests an O:N atomic ratio of 30-50. The ammonia production rate of the shallow water population of *N. concinna* at Signy in summer was estimated

to be 210 micromol/m/day. Laboratory experiments in the UK indicated that urea excretion was important in feeding limpets whereas in starved limpets excretion was almost exclusively ammonia.

B-43382

Archer, S.D., Johnston, I.A., **Kinematics of labriform and subcarangiform swimming in the antarctic fish *Notothenia neglecta***, *Journal of experimental biology*, 1989 Vol.143, p.195-210, 49 refs.

The kinematics of labriform and subcarangiform swimming have been investigated for juvenile (7-8 cm) and adult (27-30 cm) stages of the antarctic teleost *Notothenia neglecta* Nybelin at 1-2 C. Upper threshold speeds using the pectoral fins alone (labriform swimming) were 0.8L/s in adult fish and 1.4 L/s in juveniles, where L is body length. In adult fish, steady subcarangiform swimming is only used at speeds of 3.6-5.4 C/s (tail-beat frequencies of 5.0-8.3 Hz). Intermediate speeds involve unsteady swimming. In contrast, juvenile fish employ subcarangiform swimming at a range of intermediate velocities between the maximum labriform and burst speeds (2.3-8.4 L/s at tail-beat frequencies of 4.0-12.5 Hz). These differences in swimming behavior are discussed in relation to changes in life-style and muscle fibre type composition between juvenile and adult fish. Burst swimming speeds in *N. neglecta* have been compared with equivalent data from temperate species. It seems likely that low temperature limits swimming performance in antarctic fish. This is more noticeable in juvenile stages, which normally have much higher tail-beat frequencies than adult fish. (Auth.)

B-43388

Gilmer, R.W., Lalli, C.M., **Bipolar variation in *Clione*, a gymnosomatous pteropod**, *American malacological bulletin*, Aug. 1990 8(1), p.67-75, 26 refs.

The gymnosome *Clione* inhabits waters of the Arctic, North Pacific, North Atlantic, South Atlantic and antarctic oceans. This study reexamines bipolarity in this genus, utilizing new morphological techniques as well as observations of living animals in all locales. Differences in external anatomy are readily apparent in both larval and adult *Clione* from northern and southern areas, and scanning electron microscopy has revealed differences in the number and size of hooks in animals from different regions. The configuration of the radula differs between specimens from the Northern and Southern hemispheres, and *Clione* from the Antarctic lacks median radular teeth, in contrast to the well developed, sickle-shaped median teeth present in *Clione* from northern areas. *Clione* acts as a food specialist throughout its range, feeding either on the bipolar thecosome species *Limacina helicina* (Phipps) in cold waters or *L. retroversa* (Fleming) in temperate waters. Differences in maximum adult size of *Clione* can be related to the size of available prey. Although there do not appear to be differences in the feeding behavior of *Clione* from different areas, there are slight differences in swimming and escape behavior, particularly between specimens of *Clione* from northern and southern regions. The results of these anatomical and behavioral observations support the validity of recognizing two species of *Clione*, *C. limacina* (Phipps) in the Northern Hemisphere and *C. antarctica* (Smith) in the antarctic and South Atlantic oceans. (Auth.)

B-43389

Barrera, E., Tevesz, M.J.S., Carter, J.G., **Variations in oxygen and carbon isotopic compositions and microstructure of the shell *Adamussium colbecki* (Bivalvia)**, *Palaos*, Apr. 1990 5(2), p.149-159, 40 refs.

The oxygen and carbon isotopic variability within the calcitic shell of the antarctic scallop *Adamussium colbecki* has been assessed by detailed sampling of the shell margin, an external transect along the line of maximum growth, and on the interior surface of the shell. The adult shell is largely calcitic, with aragonite restricted to myostracal deposits, an extremely thin layer of aragonitic homogeneous structure

between the pallial line and the foliated inner layer of the right valve, and the fibrous ligament. No relationship between isotopic values and microstructure is apparent. Average $\delta^{18}\text{O}$ values are highest for the interior shell surface and lowest for the shell margin samples. The variability of $\delta^{18}\text{O}$ values is highest for the external shell surface. The relatively good agreement between $\delta^{18}\text{O}$ values of exterior surface samples along the growth transect of *A. colbecki*, and estimated $\delta^{18}\text{O}$ values of calcite precipitated in equilibrium with ambient waters calculated, indicate the precipitation of shell samples close to equilibrium. Because $\delta^{18}\text{O}$ values from *A. colbecki* reasonably well reflect ambient conditions, fossil forms would likely provide useful paleoenvironmental data. However, within-shell variability in $\delta^{18}\text{O}$ values cautions against making interpretations based on a few microsamples. Carbon isotopic values are highly variable throughout the shell and are likely influenced by vital effects. (Auth.)

B-43392

Del Frate, G., Caretta, G., **Fungi isolated from antarctic material**, *Polar biology*, Dec. 1990 11(1), p.1-7, Refs. p.6-7.

Fungi isolated from samples of soil, penguin, skua and petrel dung and bird feathers in Victoria Land from Inexpressible I. to Cape King, were studied. All material was collected in Dec. 1987-Jan. 1988. Fungi occurred prevalently in bird dung and in soil, especially when mosses were present. The main species isolated were: the keratinophilic *Chrysosporium verrucosum* and *Geomyces pannorum* var. *pannorum*, *Phoma herbarum* and *Thelebolus microsporus*. A variety of filamentous fungi and yeasts were also encountered in different localities: *Acremonium strictum*, *Cladosporium herbarum*, *Scolecobasidium salinum*, *Mortierella antarctica*, *Paecilomyces farinosus*, *Phialophora fastigiata*, the thermophilic *Scytalidium thermophile* and *Thermomyces lanuginosus*, *Verticillium* sp., *Mycelia sterilia*, *Cryptococcus albidus* and *Torulaspora delbrueckii*. Most of the fungal isolates appeared to be cold-tolerant. (Auth. mod.)

B-43393

Kunzmann, A., **Gill morphometrics of two antarctic fish species, *Pleuragramma antarcticum* and *Notothenia gibberifrons***, *Polar biology*, Dec. 1990 11(1), p.9-18, Refs. p.17-18.

Gill dimensions of 27 juvenile and adult *Pleuragramma antarcticum* from the southern Weddell Sea and of 28 juvenile and adult *Notothenia gibberifrons* from the South Orkney and South Shetland Is. were estimated. It is concluded that *P. antarcticum* belongs to sluggish species and, although pelagic, its routine energy costs tend to be low. However, the closely packed lamellae (NL/mm=21) indicate more active behavior in comparison with *N. gibberifrons*. A preliminary estimation of growth parameters (P,k) is presented. The sluggish behavior of *N. gibberifrons*, as expected from its benthic mode of life, is reflected by the gill parameters. After comparing gill dimensions and general respiration characteristics of fish from antarctic, temperate and tropical waters, it is concluded that antarctic fish have increased their scope for activity. (Auth. mod.)

B-43394

Larson, R.J., Harbison, G.R., **Medusae from McMurdo Sound, Ross Sea including the descriptions of two new species, *Leuckartiara brownei* and *Benthocodon hyalinus***, *Polar biology*, Dec. 1990 11(1), p.19-25, 20 refs.

Seven species of medusae were collected using scuba equipment in neritic waters of McMurdo Sound. Two species dominated, the narcomedusa *Solmundella bitentaculata* and the scyphomedusa *Diplumaris antarctica*. Two new taxa were found. *Leuckartiara brownei* n. sp., a pandeid anthomedusa, has gonads with two major longitudinal folds in the interradii and several smaller perradially directed folds. This is the first report of this genus from the southern ocean. *Benthocodon hyalinus* n. gen., n. sp., a rhopalonematoid tra-

chymedusa, has 8 linear to sinuous gonads on the radial canals. This is the second reported trachymedusa from the Ross Sea. *S. bitentaculata* ate the thecosome pteropod *Limacina helicina*. *D. antarctica* medusae fed on the gymnosome pteropod *Clione antarctica* and on *L. helicina*. The hyperiid amphipod *Hyperietta dilatata*, mostly females, was seen attached to the exumbrellas of both *D. antarctica* and *S. bitentaculata*. Up to 54 amphipods were seen on each *D. antarctica* medusa. The amphipods did no visible damage to the medusae. (Auth. mod.)

B-43395

Riehl, R., Ekau, W., **Identification of antarctic fish eggs by surface structure as shown by the eggs of *Trematomus eulepidotus* (Teleostei: Nototheniidae). Validation of the method**, *Polar biology*, Dec. 1990 11(1), p.27-31, Refs. p.30-31.

Oocytes and incubated eggs of the nototheniid fish *Trematomus eulepidotus* were observed with a scanning electron microscope to investigate whether their surface structures show a similar pattern. Oocytes were taken from the ovary or were stripped from running females. For comparison, incubated eggs of stages I and IV (classification after Apstein 1909) were sampled from a bottom trawl catch. No significant differences were found in surface pattern and interpore distances. This finding is of main importance for the determination of unknown incubated eggs from ichthyoplankton samples by SEM. *T. eulepidotus* exhibited a micropyle of type III in unfertilized eggs. Some incubated eggs were covered by hyphae of fungi, which resemble attaching-filaments of substrate spawning fishes. (Auth.)

B-43396

Ascaso, C., Sancho, L.G., Rodriguez-Pascual, C., **Weathering action of saxicolous lichens in maritime Antarctica**, *Polar biology*, Dec. 1990 11(1), p.33-39, 21 refs.

Xanthoria elegans (Link) Th Fr. and *Lecidea lapicida* (Ach.) were studied on volcanic andesite, and *Rhizocarpon geographicum* (L.) DC. and *Bacidia stipata* Lamb on a volcanogenic sediment. Feldspars were present in the rock-lichen interface to a lesser extent than in the underlying rock. *R. geographicum* was found to alter the minerals in the rock on which it grew without producing any new minerals in the rock/lichen interface, in contrast to the observations for this species on granite in temperate regions. Beneath the thallus of *L. lapicida* there were calcium oxalate and some micas of the illite type. *B. stipata*, an endemic antarctic lichen, had the greatest capacity to weather the rock and had weddellite (dihydrate calcium oxalate) and calcite in the contact area as well as many bacteria. The presence of crystalline oxalate, imogolite, allophane, carbonates (calcite) and amorphous material not found in the parent rock indicates biomineralization processes attributable to the lichens. (Auth. mod.)

B-43397

Delille, D., **Factors affecting the horizontal patchiness of coastal antarctic seawater bacteria**, *Polar biology*, Dec. 1990 11(1), p.41-45, 37 refs.

To evaluate the influence of birds manuring, the relationships between the spatial distributions of seawater bacterial microflora and some related biological (chlorophyll pigments) and physicochemical parameters were studied during the summer of 1988 in the Adélie Coast area. The clearly decreasing gradient from the shore towards the open sea previously reported for bacterial microflora was also observed for organic and mineral nutrients, but not for chlorophyll pigments. The absence of any observable phytoplankton enrichment in the coastal area suggests a direct interaction between the birds manuring and the bacterial seawater microflora. (Auth. mod.)

B-43398

Valbonesi, A., Loporini, P., **Description of two new species of *Euplotes* and *Euplotes rariseta* from Antarctica**, *Polar biology*, Dec. 1990 11(1), p.47-53, 27 refs.

Specimens of *Euplotes* were collected from the Ross Sea, allowed to multiply in the laboratory, and taxonomically studied on the basis of classical diagnostic traits as seen under the optical and scanning electron microscope. They were assigned to three different morphospecies, all characterized by a dorsal silver-line system of the "double" type and a set of 10 fronto-ventral cirri. Two morphospecies were identified as new and named *E. nobilii* and *E. euryhalinus*; one was judged reconcilable with *E. rariseta*. (Auth.)

B-43399

Buma, A.G.J., Treguer, P., Kraay, G.W., Morvan, J., **Algal pigment patterns in different watermasses of the Atlantic sector of the southern ocean during fall 1987**, *Polar biology*, Dec. 1990 11(1), p.55-62, Refs. p.61-62.

The phytoplankton community structure was studied by means of algal pigment fingerprints. A cluster analysis of the main phytoplankton pigments revealed the presence of 4 distinctive phytoplankton communities in the area. In three cluster groups phytoflagellate pigments of different taxonomical groups were found which showed different relative abundance among the cluster groups. In between the Polar Front Zone and the Weddell Scotia Confluence a fourth group was found which was rich in diatoms as compared to the other cluster groups. High concentrations of the fucoxanthin related 19'-hexanoyloxyfucoxanthin indicated the relative importance of Prymnesiophyceae during fall in this area. The relative contribution of each taxonomical group to total phytoplankton biomass was estimated by using specific pigment ratios. This calculation showed that in this time of the year phytoflagellate biomass (especially Prymnesiophytes) surpasses diatom biomass. (Auth. mod.)

B-43400

Casaux, R.J., Mazzotta, A.S., Barrera-Oro, E.R., **Seasonal aspects of the biology and diet of nearshore nototheniid fish at Potter Cove, South Shetland Islands, Antarctica**, *Polar biology*, Dec. 1990 11(1), p.63-72, Refs. p.71-72.

Approximately 1000 specimens belonging to 8 fish species were collected at Potter Cove, from Aug. 1985 to May 1986. This study deals with the dominant species *Notothenia neglecta*, *Notothenia gibberifrons*, *Trematomus newnesi* and *Notothenia rossii marmorata*. *Notothenia neglecta* was the most abundant species. It spawns in the austral autumn. Juvenile *N. rossii marmorata* migrate offshore when sexually mature. In summer, *T. newnesi* and *N. rossii marmorata*, made vertical migrations, feeding on pelagic organisms. Gammarid amphipods constituted the main food in all 4 species. Algae were consumed regularly throughout the year. Two 48 hour sampling periods, carried out in summer of 1987, showed that *N. neglecta* was more active during the day. (Auth. mod.)

B-43401

Klages, M., Gutt, J., **Comparative studies on the feeding behaviour of high antarctic amphipods (Crustacea) in laboratory**, *Polar biology*, Dec. 1990 11(1), p.73-79, 22 refs.

Feeding behavior of *Epimeria robusta* K.H. Barnard, 1930 (Paramphithoidae), *Gnathiphimedia mandibularis* K. H. Barnard, 1930 (Acanthonotozomatidae) and *Paraceradocus gibber* Andes, 1984 (Gammaridae) was observed in aquaria. The observations and the analysis of gut contents of preserved specimens demonstrate that these species have different feeding behavior and food preferences. Additional information is given from an examination of the functional morphology of the mouth parts. (Auth.)

B-43402

Van Franeker, J.A., Bell, P.J., Montague, T.L., **Birds of Ardery and Odbert Islands, Windmill Islands, Antarctica**, *Emu*, June 1990 90(2), p.74-80, 11 refs.

Ardery and Odbert Islands have been listed as a Specially Protected Area under the Antarctic Treaty because of their breeding populations of species of fulmarine petrels. The distribution and size of bird populations were surveyed in 1984/85 and 1986/87. Approximately 5000 pairs of Southern Fulmars, 300 pairs of Antarctic Petrels, 750 pairs of Cape Petrels and over 1100 pairs of Snow Petrels breed on the islands. Figures for population size were evaluated using data from selected study areas. Substantial numbers of non-breeders attend the colonies during the breeding season. (Auth.)

B-43403

Bretagnolle, V., Thomas, T., **Seabird distribution between Tasmania and Adélie Land (Antarctica), and comparison with nearby antarctic sectors**, *Emu*, June 1990 90(2), p.97-107, 35 refs.

Qualitative and quantitative observations of sea birds were made during crossings between Tasmania and Adélie Land, in Dec. of 1980, 1983 and 1984, and in Feb. 1986. From analysis of the latitudinal distribution of the 30 species encountered, four different groups were distinguished. The addition of this data to those available in neighboring regions (southern Indian and southern Pacific Oceans) has helped to clarify longitudinal distributions of these species. Strictly antarctic birds show the most homogeneous distribution. A synthesis of all data relating to movements of Mottled Petrel during the austral summer showed that the distribution of this species does not overlap with any of its closest relations among the gadfly petrels. The Mottled Petrel may be monopolizing a productive area in the absence of interspecific competition. Several other species observed (Wandering Albatross, Black-browed Albatross, Cape Pigeon, etc.) show a discontinuous distribution in latitude and in longitude, which may indicate the occurrence of two groups with different geographical origins. (Auth.)

B-43404

Sommer, U., **Comparative nutrient status and competitive interactions of two antarctic diatoms (*Corethron criophilum* and *Thalassiosira antarctica*)**, *Journal of plankton research*, Jan. 1991 13(1), p.61-75, 21 refs.

The nutrient status of two common antarctic diatoms was analyzed by studying the growth response in enrichment bioassays and by estimates of the cell quotas of Si, N and P after size-fractionation of net plankton samples. *Corethron* had higher biomass-specific N-quotas; Si- and P-quotas were quite similar between both species. *Corethron* was Si-limited in five enrichment experiments and not nutrient limited in five experiments. *Thalassiosira* was not nutrient limited in six experiments, N-limited in four experiments and Si-limited in one experiment. Droop-kinetics of Si-limited growth of *Corethron* and of N-limited growth of *Thalassiosira* were obtained by combining the growth rates in the bioassays and the cell quotas from the natural populations. As the better competitor for N and the poorer one for Si, *Corethron* became more important with increasing Si:N ratios, while *Thalassiosira* became more important with decreasing Si:N ratios in the water. (Auth. mod.)

B-43405

Hulley, P.A., Camus, P., Duhamel, G., **Ichthyological results of cruise MD-42/SIBEX-II. Part 1. Fishes from RMT-8 stations, with additional records of lanternfishes (Myctophidae: Osteichthyes) from the Indian and Atlantic sectors of the southern ocean**, *Cybius*, Mar. 1989 13(1), p.83-99, With French summary. 21 refs.

DLC QL614.C92

The taxonomic composition of the fish obtained during this cruise is reported. *Protomyctophum (Protomyctophum) choriodon* (fam. Myctophidae) and *Benthalbella macropinna* (fam. Scopelarchidae) represent new records for the Indian sector of the southern ocean. There is no evidence of a zonal distribution pattern in species found south of the Antarctic Polar Front, although a northerly spread of epipelagic East Wind Drift species may occur between 65E and 75E, in association with northerly transport in this region. Myctophid species assemblages are similar in the Indian and Atlantic sectors of the southern ocean, with no indication of population structuring within the two sectors. Analysis of lanternfish from the stomach contents confirms the vertical migratory feeding behavior of *Champsocephalus gunnari* and suggests predation confined to the epibenthic layer for *Dissostichus eleginoides*. (Auth. mod.)

B-43406

North, A.W., Ward, P., **Initial feeding by antarctic fish larvae during winter at South Georgia, *Cybium***, Dec. 1989 13(4), p.357-364, With French summary. 9 refs.

DLC QL614.C92

Initial feeding is described for larvae of four fish species from a fjord at the island of South Georgia during winter (May to Aug. 1980). The data are limited because few fish larvae were caught in winter by the shorebased sampling methods available. *Pagothenia hansonii* (11-30 mm standard length), fed on calanoid copepods, including adult *Drepanopus forcipatus*. *Harpagifer georgianus* (6.5-11 mm SL) and *Parachaenichthys georgianus* (11-17 mm SL) fed on a range of copepod taxa and stages. *Pseudochaenichthys georgianus* (14-17 mm SL) was exclusively piscivorous. Species which begin feeding during winter are larger by summer than species which hatch later in the year and therefore have a larger trophic scope during the summer peak of zooplankton biomass and abundance. There is an annual succession of larval fish species in the plankton which spreads predation on copepods throughout the year, thereby increasing the stability of the food-web, and the number of species of fish larvae that the copepods can support. The timing of the early life history of the fish larvae in relation to that of their prey species may affect the amount of food available to them. (Auth.)

B-43416

Zotier, R., **Breeding ecology of a subantarctic winter breeder: the grey petrel *Procellaria cinerea* on Kerguelen Islands, *Emu***, Sep. 1990 90(3), p.180-184, 22 refs.

The breeding ecology of the little known winter breeding Grey Petrel *Procellaria cinerea* was studied on the Kerguelen Archipelago. Adults returned to breed in Feb. The period of egg laying was less extended than has been previously suggested. Laying took place in early Apr., and hatching in late May to early June. The fledging period, 120 to 160 days, is the longest known among the petrels. The frequency at which chicks were fed affected the length of the fledging period. A particularly long fledging period is common to the southern winter breeders. (Auth.)

B-43417

Woehler, E.J., Gilbert, C.A., **Hybrid Rockhopper-Macaroni penguins, interbreeding and mixed species at Heard and Marion Islands, *Emu***, Sep. 1990 90(3), p.198-201, 6 refs.

There has been one published report of mixed species pair of *Eudyptes* penguins breeding, that of an Erect-crested *E. sclateri*-Rockhopper Penguin *E. chrysocome* pair on West Point I. in the Falkland Is. between 1961 and 1966. The only account of a hybrid eudyptid penguin was reported in 1985 documenting a Rockhopper x Royal penguin hybrid collected at Macquarie I. in 1957. Also reported was an Erect-crested Royal penguin pair during the moult period following the breeding season at Macquarie I. in Jan. 1964. Presented are details of three Rockhopper x Macaroni penguin (*E. chrysolophus*) hybrids from Heard and Marion Is. Additionally, a

Rockhopper-Macaroni penguin hybrid was observed at 'Landfall Beach', Marion I. in Apr. 1989. A third mixed species pair of Rockhopper and Macaroni penguins was also sighted at the same location. The pair was observed moulting and allopreening.

B-43418

Bost, C.A., Jouventin, P., **Laying asynchrony in Gentoo penguins on Crozet Islands: causes and consequences, *Ornis scandinavica***, Mar. 1990 21(1), p.63-70, Refs. p.69-70.

In contrast to the majority of subantarctic species, the Gentoo penguin *Pygoscelis papua* has a long laying season, especially in the Crozet archipelago. A 3-year study at this locality has provided the first detailed analysis of laying patterns and interannual variations in its breeding. Unusually large variations in the timing of breeding may be related to food shortage early in the breeding season. The capacity of this penguin to overcome reproductive failure by re-laying seems to be the major factor responsible for the extended laying season. Delayed laying in the Gentoo penguin is unexpected for a bird of smaller size and shorter breeding cycle than larger seabirds such as albatrosses and King penguins *Aptenodytes patagonicus* that also exhibit this phenomenon. (Auth. mod.)

B-43419

Wägele, H., **Revision of the antarctic genus *Notaeolidia* (Gastropoda, Nudibranchia), with a description of a new species, *Zoologica scripta***, 1990 19(3), p.309-330, 18 refs.

New material from the Atlantic sector of the antarctic ocean allows a revision of the antarctic genus *Notaeolidia* Eliot, 1905. One new species (*Notaeolidia schmekelae* sp.n.) is described. *N. depressa* Eliot, 1905 and *N. gigas* Eliot, 1905, which are poorly known, are redescribed. *N. rufopicta* Thiele, 1912, *N. robsoni* Odhner, 1934, *N. subgigas* Odhner, 1944, *N. alutacea* Minichev, 1972 and *N. flava* Minichev, 1972 are synonymized with *N. depressa*. *N. purpurea* Eliot, 1905 is synonymized with *N. gigas*. The monogeneric family Notaeolidiidae Odhner, 1926, is characterized by nephroproct in front of the genital apertures. Too little is known to elaborate the phylogenetic position of the family Notoaeolidiidae within the cladobranch Nudibranchia. (Auth. mod.)

B-43425

Feller, G., **Lipases from psychrotrophic antarctic bacteria, *FEMS microbiology letters***, 1990 66(1-3), p.239-243, 15 refs.

Properties of lipases excreted by 4 psychrotrophic *Moraxella* strains from antarctic sea water have been investigated. Despite an optimal cell generation time at 25 C, maximal lipase excretion essentially occurs at low temperatures. These enzymes are characterized by a shift of the apparent optimal activity towards low temperatures, by a reduction of the activation energy value and by a decrease in heat stability. These lipases are associated with lipopolysaccharides, forming high molecular weight complexes. One of the selected strain is able to express the antibiotic resistances carried by RP4, at both 4 and 25 C. (Auth.)

B-43462

Montgomery, J., **Biomedical research in Antarctica, Antarctica 150: scientific perspectives, policy futures**. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.21-29, Refs. p.26-29.

As an example of antarctic biomedical research conducted at the University of Auckland, reviews of the evolution and physiological and biochemical temperature adaptation of notothenioid fishes, as well as the diving physiology of the Weddell seal, are presented.

B-43463

Foster, B.A., **Marine world**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.31-37, 28 refs.

Auckland University zoologists are studying the metabolic and physiological adaptations of fishes in the cold waters of McMurdo Sound, and how they detect their prey in both dim light under the ice during the summer and with darkness during the winter. The planktonic component of the McMurdo Sound ecosystem is also being studied, and findings belie reported simplicity of antarctic food webs that lead from phytoplankton to penguins and marine mammals. The presence of scientific programs has introduced an extra mammal into the ecosystem, with concomitant ecosystem consequences. (Auth. mod.)

B-43470

Hsiao, K.C., Cheng, C.H.C., Fernandes, I.E., Detrich, H.W., DeVries, A.L., **Antifreeze glycopeptide gene from the antarctic cod *Nototothenia coriiceps neglecta* encodes a polyprotein of high peptide copy number**, *National Academy of Sciences, Washington, D.C. Proceedings*, Dec. 1990 87(23), p.9265-9269, 44 refs.

The antarctic fish *Nototothenia coriiceps neglecta* synthesizes eight antifreeze glycopeptides to avoid freezing in its ice-laden freezing habitat. Reported here is the sequence of one of its AFGP genes. The structural gene contains 46 tandemly repeated segments, each encoding one AFGP peptide plus a 3-amino acid spacer. Most of the repeats (44/46) code for peptides of AFGP 8; the remaining 2 code for peptides of AFGP 7. At least 2 of the 3 amino acids in the spacers could act as substrate for chymotrypsin-like proteases. The nucleotide sequence between the translation initiation codon (ATG) and the first AFGP-coding segment is G+T-rich and encodes a presumptive 37-residue signal peptide of unusual sequence. Primer extension establishes the transcription start site at nucleotide 43 upstream from ATG, CAAT and TATA boxes begin at nucleotides 53 and 49, respectively, upstream from the transcription start site. The polyadenylation signal, AATAAA, is located about 240 nucleotides downstream from the termination codon. A mRNA was found that matches the size of this AFGP. Thus, this AFGP gene encodes a secreted, high-copy-number polyprotein that is processed posttranslationally to produce active AFGPs. (Auth.)

B-43471

Wiencke, C., tom Dieck, I., **Temperature requirements for growth and temperature tolerance of macroalgae endemic to the antarctic region**, *Marine ecology progress series*, June 1989 54(1-2), p.189-197, 35 refs.

Temperature requirements for growth and upper temperature tolerance were determined in 6 brown algal and 1 red algal species endemic to the antarctic region. In microthalli of *Himantothallus grandifolius*, *Phaeurus antarcticus*, *Desmarestia anceps* and in a ligulate member of *Desmarestia* (Desmarestiales) growth was possible from 0 C up to between 10 and 15 C, and maximum survival temperatures were between 13 and 16 C. Desmarestielean macrothalli grew optimally between 0 and 5 C and exhibited upper survival temperatures of 11 to 13 C. The upper survival temperature of microthalli of *Elachista antarctica* (Chordariales) was 18 C. *Ascoseira mirabilis* (Ascoseirales) grew at 0 up to 10 C and survived 11 C. *Palmaria decipiens* (Palmariales) grew at 0 up to 10 C and maximum survival temperature was 16 to 17 C. All considered algae are stenotherm cold water species. Their northern distribution is determined by the winter temperature, just low enough to allow sufficient growth of the most temperature-sensitive stage in the life cycles of the studied species. Temperature tolerance does not limit algal distribution. (Auth.)

B-43475

Voisin, J.F., **Movements of giant petrels *Macronectes* spp. banded as chicks at Iles Crozet and Kerguelen**, *Marine ornithology*, Dec. 1990 18(1/2), p.27-36, 14 refs.

Totals of 1,299 Northern Petrels *Macronectes halli* and 884 Southern Giant Petrels *M. giganteus* were banded as chicks at Îles Crozet from 1966 to 1988, and 1,105 *M. halli* were banded at Îles Kerguelen from 1950 to 1988. Recovery rates were very low, averaging 1.6% for *M. halli* and 0.7% for *M. giganteus*. They do not give a true idea of the mortality of banded birds. Most recoveries occurred in the Australia-New Zealand region, but there is no indication that juvenile giant petrels stay in special wintering areas. There are on the contrary, good indications that they disperse downwind from west to east throughout the southern ocean. (Auth.)

B-43476

Woehler, E.J., **First records of Kerguelen petrel *Pterodroma brevirostris* at Heard Island**, *Marine ornithology*, Dec. 1990 18(1/2), p.70-71, 8 refs.

This is a brief account of the first two sightings of this species at Heard I. One was captured in Feb. 1988, photographed, examined for parasites, measured, and released. The other, apparently, was a victim of a skua predator with only the pectoral girdle and a pair of wings being found.

B-43477

Woehler, E.J., **Two records of seabird entanglement at Casey, Antarctica**, *Marine ornithology*, Dec. 1990 18(1/2), p.72-73, 3 refs.

Two instances of bird deaths from fishing line and wire entanglements are reported along with speculation as to where the injurious materials originated and how they may have gotten to where the deaths occurred.

B-43478

Slip, D.J., Green, K., Woehler, E.J., **Ingestion of anthropogenic articles by seabirds at Macquarie Island**, *Marine ornithology*, Dec. 1990 18(1/2), p.74-77, 21 refs.

Plastic particles and other anthropogenic debris are now common pollutants of the ocean surface. Plastic marine pollution is widespread, with debris washing up on sub-antarctic and antarctic beaches. Ingestion of plastics by sea birds has been reported for a number of species. Recently, plastic ingestion has been reported from sea birds breeding off the coast of Antarctica and from sub-antarctic sea birds off New Zealand and southern Africa. In this paper, the first records are reported of ingestion of anthropogenic material by sea birds at Macquarie Island.

B-43480

Curry, G.B., Ansell, A.D., James, M., Peck, L., **Physiological constraints on living and fossil brachiopods**, *Royal Society of Edinburgh: Earth sciences. Transactions*, 1989 Vol.80, p.255-262, Refs. p.261-262.

The oxygen consumption rates of several living brachiopods have been measured. When respiring tissue in caeca in the shell is taken into consideration, it is clear that brachiopod metabolic rates are low when compared with other marine invertebrates (e.g. between 10% and 50% of the oxygen uptake of comparable gastropods and bivalve molluscs held in similar conditions). Nitrogen excretion rates have also been measured for a few living brachiopods, allowing a comparison with rates of oxygen consumption and providing an indication of the metabolic substrates used. These data on oxygen:nitrogen ratios suggest that one antarctic brachiopod utilizes exclusively protein as a metabolic substrate, while a temperate latitude species uses mainly protein during winter but lipids and carbohydrates during summer

months. It seems that the ability to store nutrients in the mantle, combined with flexibility of substrate utilization and an inherently low metabolic rate, have been important factors in brachiopod evolution. (Auth. mod.)

B-43484

Peck, L.S., Holmes, L.J., **Scaling patterns in the antarctic brachiopod *Liothyrella uva* (Broderip, 1833)**, *Journal of experimental marine biology and ecology*, 1989 133(1/2), p.141-150, 18 refs.

Scaling patterns of shell thickness, shell volume, total animal volume, internal tissue volume and mantle cavity volume in the brachiopod *Liothyrella uva* (Broderip, 1833) were investigated in relation to shell length. The amount of shell material decreases in relation to other brachiopod tissues as animals grow, while the mantle cavity gets relatively larger. These results suggest that large brachiopods may suffer space constraints because of the volume needed to house the lophophore, and this has implications for all aspects of the brachiopods life style. Data on ash-free dry weight (AFDW) assessments of shells from an early winter sample showed a slope of 2.78, which is consistent with the shell volume relationship. A sample from mid-summer, however, produced a relationship which was different in large and small animals. These data indicate that the function of caeca changes when brachiopods become reproductive. (Auth. mod.)

B-43493

Thirot Quiévreux, C., Albert, P., Soyer, J., **Karyotypes of five subantarctic bivalve species**, *Journal of molluscan studies*, Feb. 1991 57(1), p.59-70, 26 refs.

Chromosomes of five subantarctic species were studied from mitotic metaphases using cell suspension techniques. Among the Protobranchia, *Malletia gigantea* has a diploid chromosome number of $2n=38$ with five metacentric, seven submetacentric, five subtelocentric and one telocentric pairs, and *Yoldia (Aequiyoldia) woodwardi* also shows $2n=38$ but with ten metacentric, six submetacentric and three subtelocentric pairs. Among the Lamellibranchia, the pterioidan *Limatula pygmaea* has $2n=38$ with six metacentric, eleven submetacentric and two subtelocentric pairs, the veneroidan *Cyclocardia astartoides* has $2n=30$ with five metacentric and ten telocentric pairs, and the anomalodesmatan *Laternula elliptica* has $2n=40$ with two metacentric, one submetacentric, two subtelocentric and fifteen telocentric pairs. The results indicate that in all the Nuculoidea studied so far, a diploid number of $2n=38$ has been found. In addition, the karyotypes show a close overall appearance in relative lengths with a majority of metacentric-submetacentric chromosomes. In the Lamellibranchia, each species corresponds to a particular case within their respective orders (Pterioida, Veneroida, Anomalodesmata). (Auth.)

B-43494

Hudson, J.A., Daniel, R.M., Morgan, H.W., **Isolation of a strain of *Bacillus schlegelii* from geothermally heated antarctic soil**, *FEMS microbiology letters*, 1988 51(1), p.57-60, 14 refs.

A bacterium capable of growth from 59 to 72 C was isolated from geothermal soil collected from Mount Erebus on Ross I. The isolate was enriched in medium containing thiosulphate and bicarbonate. Subsequently the organism was found also to be capable of heterotrophic growth and autotrophic growth in the presence of hydrogen and carbon dioxide. In a comparison with *Bacillus schlegelii* and *Bacillus tusciae* the isolate most closely resembled *B. schlegelii*. This conclusion was supported by the finding that *B. schlegelii* is also capable of autotrophic growth using thiosulphate. The new isolate had a characteristic subunit layer on the cell wall which is typical of *B. schlegelii*. (Auth.)

B-43510

Pickup, J., **Strategies of cold-hardiness in three species of antarctic dorylaimid nematodes**, *Journal of comparative physiology B*, 1990 160(2), p.167-173, 20 refs.

Three species of free-living antarctic fellfield nematodes, *Eudorylaimus coniceps*, *E. spaulli* and *E. pseudocarteri* exhibited differing degrees of both strategies of cold-hardiness: freeze-tolerance and freeze-avoidance. Bimodal distributions of supercooling points were obtained from monthly field samples of both *E. coniceps* and *E. spaulli*. Individuals found in the low group of this distribution (supercooling to <-15 C) were capable of avoiding freezing by extensive supercooling (to a mean temperature of about -22 C), sufficient to withstand the environmental extremes of the maritime Antarctic. The high groups of both these species, and almost all *E. pseudocarteri*, were likely to have frozen at some stage during winter. Survival of freezing increased with the temperature at which nucleation occurred, and has been described by a Gompertz model. Estimates of the supercooling points at which survival fell to 50% were -10.4, -7.1 and -6.1 C for *E. coniceps*, *E. pseudocarteri* and *E. spaulli*, respectively. (Auth.)

B-43511

Gutt, J., Piepenburg, D., **Dense aggregations of three deep-sea holothurians in the southern Weddell Sea, Antarctica**, *Marine ecology progress series*, Jan. 1991 68(3), p.277-285, 64 refs.

Spatial distribution patterns of elasipod holothurians from the southern Weddell Sea were studied by analyzing underwater photographs and trawl-catch data from 7 stations, ranging in depth from 240 to 1200 m. The 3 investigated species (*Elpidia glacialis*, *Achlyonice violaeuspidata*, *Scotoplanes globosa*) occurred in dense aggregations of differing spatial scale. For the first 2 species, median photographically determined densities within the patches were 17 and 6 ind. m/sq m respectively. The size-frequency distributions of all species were relatively broad. A behavioral communication between individuals assuring the formation and persistence of these aggregations is proposed. (Auth.)

B-43512

British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988, Heywood, R.B., ed, **University research in Antarctica**, Cambridge, British Antarctic Survey, 1989, 134p., Refs. passim. For individual papers see B-43518 through B-43527, F-43517, I-43515, I-43516, K-43513, and K-43514.

This volume presents 15 contributions to the symposium covering the following studies: the inner magnetosphere; the physics of ionospheric storms; Antarctica and the flow in the Southern Hemisphere's troposphere; the causes of turbulence and internal gravity waves in the atmospheric boundary layer; the use of satellite radar altimetry data to measure ice sheet and ice shelf photography; the growth and mortality rates of krill, using body length measurements; metabolism and growth of the mollusc *Yoldia eightsi*; muscles and activity metabolism in fish; fish adaptation to low temperature; behavior in the Blue-eyed shag as a possible indicator of man's impact on the local marine ecosystem; growth temperatures of bacteria; water relations in mosses; temperature relations of a protozoan; and predation by arthropods.

B-43518

Basson, M., Beddington, J.R., **Preliminary analysis of growth and mortality rates of antarctic krill (*Euphausia superba*) from length frequency samples**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.51-55, 29 refs.

Antarctic krill is a key species in the food chain of the southern ocean, and the focus of a potential major fishery. However, relatively little information is available on the population dynamics of this species. Body length data on krill from the *Discovery* investigations have been re-analyzed to obtain preliminary estimates of seasonal growth rates and mortality rates. (Auth.)

B-43519

Davenport, J., **Feeding, oxygen uptake, ventilation rate and shell growth in the antarctic protobranch bivalve mollusc *Yoldia eightsi* (Courthouy)**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.57-63, 16 refs.

Primarily a deposit feeder, the protobranch bivalve mollusc *Yoldia eightsi* (Courthouy) also collects diatoms by filter feeding. In summer *Y. eightsi* processes about 8 times its body weight of sediment/d and ingests about 0.6% of the material it sorts. Oxygen uptake of *Y. eightsi* was monitored at 0.2 C and 2.5 C. There was no significant difference between the uptake values recorded at these temperatures. The b value of the allometric equation relating oxygen uptake to dry tissue weight is close to 0.8. Ventilation of the mantle cavity is intermittent, the pumping ctenidia producing ventilatory pulses every 12-15 s. Ventilation rate changed little over the temperature range 0-3 C. The temperature-independence of oxygen uptake and ventilation at low temperature will have ecological advantages for the species, but conflicts with the expectation that Q10 values are high at low temperatures. Shell growth is slow. (Auth. mod.)

B-43520

Johnston, I.A., **Muscles and activity metabolism in antarctic fish: a review**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.65-76, Refs. p.75-76.

The maximum labriform swimming speed for *Notothenia neglecta* (31 cm body length) is 0.8 body lengths per second (L/s), at a pectoral fin-beat frequency of 1 Hz (at 1-2 C). Steady sub-carangiform swimming is used at speeds of 3.6-5.4 L/s. The myotomes of *N. neglecta* are almost exclusively composed of very large diameter (80-450 micron) fast twitch fibers, which are dependent on creatine phosphate hydrolysis for their energy supply. This limits burst swimming endurance to a relatively few tail-beats. Sub-carangiform swimming is used at cruising speeds by the pelagic juvenile stages of demersal species and by the adult stages of some species which have become secondarily adapted to mid-water life. The myotomes of these fish contain a higher proportion of slow twitch muscle fibers than demersal species. Many of the physiological characteristics of notothenioids, including slow growth and low metabolic rates, are related to the special features of the antarctic marine environment. (Auth. mod.)

B-43521

O'Neill, J.G., **Lymphoid organ development in antarctic teleosts**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.77-86, Refs. p.85-86.

The lymphoid organs of 5 antarctic species (*Pleuragramma antarcticum*, *Trematomus newnesi*, *Notothenia larseni*, *Notothenia neglecta*, *Harpagifer* sp.) indicated a basic development and anatomical structure equivalent to those of warmer water species. Certain developmental aspects within the antarctic species indicated a suppressive influence of low temperature. These were the post-hatch develop-

ment of the thymus (+4 weeks in *Harpagifer* sp.), a reduced thymic involution (reduced mucous cell and cyst development and a lack of myoid cells) and the reduced development of melano-macrophage centers within the spleen and kidney. Even within the antarctic species a temperature dependence may be present, with a slower development in the strict stenothermal species (*P. antarcticum*, *T. newnesi*), when compared to the wide stenothermal (*N. larseni*, *N. neglecta*) and eurythermal (*Harpagifer* sp.) species. (Auth.)

B-43522

Rankin, J.C., **Blood circulation and gill water fluxes in the icefish, *Chaenocephalus aceratus* Lönnberg**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.87-91, 23 refs.

Noradrenaline decreased branchial vascular resistance *in vivo* and in an isolated perfused gill preparation in the icefish, *Chaenocephalus aceratus*. It had little effect on tritiated water fluxes in the perfused preparation, and adrenaline had little effect on tritiated water turnover *in vivo*. Changes in perfusion rate had marked effects on tritiated water exchange in the perfused preparation. The vascular effects of the catecholamines were similar to those reported in other teleosts. The catecholamine and perfusate flow effects on water fluxes were very different from those reported in the eel; this has important implications for the theory of lamellar recruitment. (Auth.)

B-43523

Cobley, N., **Aspects of the survival of blue-eyed shags (*Phalacrocorax atriceps* King)**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.93-96, 14 refs.

Various aspects of population dynamics of the blue-eyed shag, *Phalacrocorax atriceps*, are examined, including survival, recruitment and colony fidelity, using an 18-year data set from Signy I. Comparisons are made with the European shag, *P. aristotelis*. *P. atriceps* does not migrate, and may prove to be a useful indicator of man's future impact on the local marine ecosystem. (Auth. mod.)

B-43524

Upton, A.C., Nedwell, D.B., **Temperature responses of bacteria isolated from different antarctic environments**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.97-101, 24 refs.

The optimum and maximum temperatures for growth of bacteria isolated from terrestrial fellfield soils, freshwater sediment and inshore marine sediment, on and around Signy I., Antarctica were determined in an aluminium block gradient incubator. The proportion of psychrophiles, relative to psychrotrophs, was very low in each environment despite the permanently low temperatures of the inshore marine and freshwater environments. In contrast, the seasonal and diurnal temperature variations of the two fellfield sites were both large. The optimum growth temperatures of bacteria isolated from each sample site were determined and compared with the temperature regimes of their habitats. (Auth.)

B-43525

Noakes, T.D., Longton, R.E., **Studies on water relations in mosses from the cold Antarctic**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.103-116, 38 refs.

In a survey of structural features associated with water uptake and movement in mosses from hydric, mesic and xeric habitats on Signy I., a central strand of water-conducting hydroids was found to be most strongly developed in the mesic species *Bartramia patens* and *Polytrichum alpinum*. Water content at full turgor was recorded as between 150-200% dry wt in most species, with higher values in *B. patens* and the hydric species *Drepanocladus uncinatus*, but the results varied with speed and time of centrifugation. In transpiration experiments significant internal conduction was recorded only in *B. patens*, and in *P. alpinum* where internal conduction was adequate to maintain water content close to full turgor. Growth rates in the xeric species appeared to be inherently low. In contrast, shoots of *D. uncinatus* elongated at rates up to 9 mm in six weeks at 10 C. Growth rate was strongly related to shoot water-content, and was most rapid at water contents substantially above full turgor. (Auth. mod.)

B-43526

Hughes, J., Smith, H.G., **Temperature relations of *Heteromita globosa* Stein in Signy Island fellfields**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.117-122, 20 refs.

The influence of temperature on the behavior and population growth rates of an isolate of *Heteromita* from Signy I., and of an isolate from a northern temperate soil, was determined. Trophozoites of both isolates in monoxenic culture showed optimum growth temperatures between 22 and 24 C, and both showed psychrotrophy at sub-optimal temperatures down to 1.5 C, at which temperature-induced encystment ensued. Excystment occurred with rising temperature at the same threshold temperature. The antarctic isolate, compared with the temperate isolate, showed enhanced motility, population growth rates and synchrony of excystment at low sub-optimal temperatures. It is considered that these characteristics constitute precise adaptations to the thermal regime of the antarctic fellfield environment, ensuring survival during diurnal freeze-thaw cycles and optimal utilization of resources during short periods of favorable conditions. (Auth.)

B-43527

Usher, M.B., Block, W., Jumeau, P.J.A.M., **Predation by arthropods in an antarctic terrestrial community**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.123-129, 18 refs.

Predation by the mesostigmatid mite *Gamasellus racovitzai* is analyzed, in simple terrestrial communities of the maritime Antarctic. Comparison is made between communities where *Gamasellus* is the sole arthropod predator and where there is a second mite predator, *Rhagidia gerlachei*. Laboratory observations on the predatory behavior and morphological variation of *Gamasellus* demonstrated that prey of a particular size were taken, and confirmed the occurrence of two subspecies. Field studies showed that when it was the sole predator, *Gamasellus* did not select between the collembolans, *Cryptopygus antarcticus* and *Parisotoma octooculata*, and that it retained a catholic diet in the presence of *Rhagidia*. The latter species of predator appeared to specialize on *Parisotoma*. These observations

are discussed in terms of connectance levels and the strengths of the pathways in the foodwebs of the two communities. (Auth. mod.)

B-43529

Karentz, S., Cleaver, J.E., Mitchell, D.L., **DNA damage in the Antarctic**, *Nature*, Mar. 7, 1991 350(6313), p.28, 5 refs.

Evaluations of ultraviolet exposures and phytoplankton photobiological responses were made on Anvers I. Nine diatom species spanning three orders of magnitude were examined. All showed evidence of photoreactivation and excision repair. The results indicate that antarctic phytoplankton have diverse capabilities for sustaining and repairing UV damage to DNA.

B-43553

Burton, H.R., McMeekin, T., Nichols, P.D., Hirsch, P., **Ecology and molecular biology of antarctic micro-organisms (EMBAM)**, 1990-91 Australian Antarctic Research Program. Antarctic Treaty exchange information: Supplement A to particulars for ANARE, Kingston, Tasmania, 1990, p.103-106, 9 refs.

A project is proposed to discover the distribution and abundance of at least 3 groups of bacteria at selected depths in the water columns of a number of marine and saline lake sites; to measure the growth rate of aquatic bacteria in some of the above sites by a technique based on the rate of incorporation of tritiated thymidine into cellular DNA; to sample and culture micro-organisms from all the habitats in the Ekho Lake environment, including sediment, ice and a range of water depths. The aim is to make as near a total inventory of lake micro-organisms as possible, using extremely diverse microbiological techniques; and to collect lipid samples from the water column with a sea-star sampler, and to reference these to micro-organisms identified from the same depths.

B-43554

Cooper, P., Crowley, H., Shaughnessy, P., **Energetics of lactation and foraging in antarctic and subantarctic fur seals at Macquarie Island**, 1990-91 Australian Antarctic Research Program. Antarctic Treaty exchange information: Supplement A to particulars for ANARE, Kingston, Tasmania, 1990, p.114-117, 5 refs.

A project is proposed to measure milk composition throughout lactation in *Arctocephalus gazellais* and *A. tropicalis*, and milk consumption (energy intake) of the pups; relate these measures to pup growth and lactational strategies (maternal attendance patterns and length of lactation) of the two species; to examine the diet of the fur seals for within-season variation (during the lactation season); to measure the daily energy expenditure of lactating females and estimate the total energy requirements for lactating animals; to relate these data to the diet and lactational strategies of the two species; to investigate the foraging patterns of lactating females at sea; to relate this to the energy budgets of females to understand how females allocate energy; to compare patterns of pup growth, diet, energetics and foraging of female *A. gazella* to patterns from animals in South Georgia; to use the data to comment on the vulnerability of the Macquarie I. fur seal population to ecosystem change, and the ability of the Macquarie I. ecosystem to sustain increasing populations of fur seals.

B-43555

Cullen, J.M., Goldsworthy, S.D., Shaughnessy, P.D., **Maternal attendance and pup growth in fur seals *Arctocephalus* spp. at Macquarie and Heard Islands**, 1990-91 Australian Antarctic Research Program.

Antarctic Treaty exchange information: Supplement A to particulars for ANARE, Kingston, Tasmania, 1990, p.120-123, 12 refs.

A project is proposed to determine the duration of foraging trips and shore-attendance bouts of fur seals on Macquarie I. from birth through to late lactation; to determine the annual and within-season variation in maternal attendance and pup growth on Macquarie I.; to compare this with data collected on Heard I.; to model the relationship between maternal attendance and offspring growth with data collected from two seasons on Macquarie and one on Heard I.; to use this model to provide a measure of the status of marine ecosystems and ecosystem monitoring; to compare patterns of maternal attendance and pup growth observed on Macquarie and Heard Islands to patterns observed in South Georgia; and to relate these to differences in the marine ecosystem.

B-43556

Greenslade, P.J.M., Farrow, R.A., **Insect migration and monitoring studies on Macquarie Island**, 1990-91

Australian Antarctic Research Program. Antarctic Treaty exchange information: Supplement A to particulars for ANARE, Kingston, Tasmania, 1990, p.129-132, 12 refs.

A project is proposed to continue to monitor wind-transported insects to Macquarie I. in order to establish which species can disperse long distances by this method in the subantarctic and from where they originate. From this it is hoped to predict what new introductions could occur, and to increase understanding of long-distance dispersal by insects. Synchronously with the wind-trapping, it is planned to trap ground invertebrates on sites sampled in 1986-87 that are being heavily used by tourist groups, in an attempt to document any changes that might be taking place in the fauna; and to study community interactions and life histories of some native invertebrates during summer.

B-43557

Moritz, C., Slade, R., McCallum, H., **Southern elephant seal, *Mirounga leonina*: molecular population genetics and relationship to other southern ocean pinnipeds**, 1990-91

Australian Antarctic Research Program. Antarctic Treaty exchange information: Supplement A to particulars for ANARE, Kingston, Tasmania, 1990, p.148-151, 19 refs.

A project is proposed to use maternally and biparentally inherited DNA markers to describe on a fine scale the genetic structure of the Macquarie I. elephant seal population and, on a broader scale, to compare the three main breeding populations in the South Pacific, South Indian and South Atlantic oceans; and to use these DNA markers as a tool for resolving phylogenetic issues in the pinnipeds.

B-43559

Upton, A.C., Nedwell, D.B., **Nutritional flexibility of oligotrophic and copiotrophic antarctic bacteria with respect to organic substrates, *FEMS microbiology ecology***, 1989 Vol.62, p.1-6.

The nutritional flexibility of oligotrophic and copiotrophic bacteria from an antarctic freshwater lake sediment was investigated. Bacteria isolated on plates of oligotrophic and copiotrophic media were replica plated onto media containing different substrates, and their ability to utilize the different substrates was determined. The oligotrophs were able to utilize a significantly broader range of organic substrates than the copiotrophs, consistent with the idea that nutritional flexibility is adaptive for oligotrophic bacteria. (Auth.)

B-43581

Williams, T.D., **Foraging ecology and diet of gentoo penguins *Pygoscelis papua* at South Georgia during winter and an assessment of their winter prey consumption**, *Ibis*, Jan. 1991 133(1), p.3-13, 47 refs.

This paper describes the diet, foraging activity and population size of gentoo penguins during two austral winters, 1987 and 1988, at Bird I., South Georgia, and estimates prey consumption by the South Georgia population during winter. Antarctic krill was the main prey species taken, forming 87% or more (by weight) of the diet in Sep. 1987 and May-Sep. 1988, when the total sample weights were 320-670 g. In July-Aug. 1987, crustaceans formed 87% of the diet of females but fish formed 83% of the diet of males, and total sample weights were about 125-200 g. A greater variety of prey was taken in July-Aug. 1987. These differences may have reflected low availability of krill around South Georgia, within the bird's foraging area, during part of the 1987 winter. Reasons for the sex difference in diet are discussed: gentoo penguins show sexual dimorphism in bill size, and males are larger and may be better able to catch fish prey. The estimated minimum weight of all prey consumed in winter by the South Georgia population of 311,266 birds was 11,200 and 19,600 tonnes in 1987 and 1988, respectively. This comprised 60% krill, 6% other crustaceans and 34% fish in 1987, and 98% krill and 2% fish in 1988. (Auth. mod.)

B-43582

Bost, C.A., Jouventin, P., **Breeding performance of the gentoo penguin *Pygoscelis papua* at the northern edge of its range**, *Ibis*, Jan. 1991 133(1), p.14-25, 52 refs.

Gentoo penguins *Pygoscelis papua* on the Crozet Is. have a unique timing of breeding, which occurs in winter and is considerably protracted, differing greatly from that of other populations breeding south of the antarctic convergence. Their breeding biology was intensively studied in 1983-1989, involving daily observations in 1983-1985. Winter breeding is associated with an extension of laying, chick rearing, foraging trips and premoult periods, a lower breeding success and a high weight loss. Annual variations in breeding performances were less pronounced than for southern populations. Variations in breeding success were closely associated with variations in feeding frequencies, fledging and breeding weight, and timing of laying. Early breeders were at an advantage over late breeders in terms of breeding success, growth patterns, fledging weight, duration of foraging trips and premoult period. The unusual winter breeding coincides with a time when food is most readily available for chick rearing in restricted foraging conditions at the edge of the species' breeding range. (Auth.)

B-43605

Williams, T.D., Croxall, J.P., **Annual variation in breeding biology of macaroni penguins, *Eudyptes chrysolophus*, at Bird Island, South Georgia**, *Journal of zoology (London)*, Feb. 1991 223(2), p.189-202, 40 refs.

The breeding biology of the macaroni penguin, *Eudyptes chrysolophus*, was studied over 4 years, 1976 and 1986-88, at Bird I. Birds were migratory, being absent during winter (May to Sep.). The pre-breeding, incubation and chick-brooding period was characterized by long fasts ashore, for 36 and 39 days in males and 41 days in females, alternating with long periods at sea. Within years egg-laying was highly synchronous: 95% of clutches initiated within 4-6 days. Arrival date and mean egg-laying date were later (by 3 days), and breeding population size lower (by 20%) in 1987, compared to other years. The incubation period was 35 days and comprised 3 long shifts, the first shared by the male and female, the second by the female and the third by the male. In 1986 and 1988 these were of 12, 12 and 9 days' duration, but in 1987 the first shift was significantly shorter: 9 days. Chicks creched at 23-25 days of age and fledged at 60 days. Neither chick age nor weight at creching or fledging varied between the years 1986-88. The breeding biology of macaroni pen-

guins at Bird I. is compared with that of other *Eudyptes* penguins, and with the sympatric gentoo penguin, *Pygoscelis papua*. There is little variation in breeding biology within the genus *Eudyptes*, except in the length of time spent at sea prior to the annual moult. (Auth. mod.)

B-43606

Smith, W.O., Jr., Garrison, D.L., **Marine ecosystem research at the Weddell Sea ice edge: the AMERIEZ program**, *Oceanography*, Nov. 1990 3(2), p.22-29, 33 refs.

The AMERIEZ study has investigated two major questions: what are the mechanisms which result in enhanced productivity at all trophic levels within the marginal ice zone? Is the ice edge an ecological interface between two distinct biological communities, one associated with the open ocean and one with the pack ice, and what are the dynamics of these seasonal communities? To address these questions, the distributions of fauna and flora and, whenever possible, their rate processes were measured over a wide range of conditions during different seasons within the marginal ice zone. A multidisciplinary program was designed to sample seasonally within the marginal ice zone; a list of the specialties addressed and the program's Principal Investigators are presented. The marginal ice zone of the Weddell Sea was chosen as the study site because of the large role it plays in thermohaline circulation, deep water formation and oceanic biogeochemical cycles. Based on satellite images of ice conditions from previous years, the presence and seasonal dynamics of ice in the Weddell Sea were also more predictable than in many other areas, and the region afforded a study site which was in deep water, easily accessible (relative to other potential antarctic sites), and removed from features generated by complicated bottom topography.

B-43621

Kensley, B., **Marine isopod crustaceans from the St. Paul and Amsterdam Islands, southern Indian Ocean**, *Paris. Museum national d'histoire naturelle. Bulletin*, 1989 11(1), p.147-164, 13 refs.

Nineteen species of isopods collected during the cruise MD. 50/Jasus of R/V *Marion Dufresne* in July 1986 are recorded from the waters around the St. Paul and Amsterdam Islands, of which 13 are identified to species level. Included are 8 species previously recorded from this region. One new genus, *Bathylana*, and 3 new species, *Bathylana apalpalis*, *Joeropsis sarictipauli* and *Metacirolana arnaudi*, are described. The asellote *Desmosoma longimana* (Vanhöffen) is recorded outside of the antarctic region for the first time. The species of this collection reaffirm the presence of antarctic, subantarctic and southern African elements in the fauna. (Auth.)

B-43632

IAkovlev, V.N., **Oceanographic research and prospects of exploitation of the southern ocean** [Perspektivy kompleksnykh promyslovo-okeanologicheskikh issledovaniĭ v IUzhnom okeane], *Sovetskaia antarkticheskaiia ekspeditsiia. Trudy*, 1988 Vol.83, p.111-115, In Russian. 10 refs.

To increase the effectiveness of investigating biological resources of the southern ocean, the following areas of research are recommended: water structure and dynamics; krill and fish resources and their distribution; the structure and functioning principles of the ecosystem as a whole; and evaluation of the effects of fisheries on the ecosystem.

B-43636

Peter, H.U., **Abundance and reproduction of some antarctic birds and seals in southwestern parts of King George Island, South Shetland Islands** [Bestand und Reproduktion ausgewählter antarctischer Vögel und Robben im Südwestteil von King George Island, South Shetland Islands], *Friedrich Schiller Universität, Jena. Wissenschaftliche Zeitschrift. Naturwissenschaftliche Reihe*, 1989 38(4/5), p.645-657, In German with English and Russian summaries. 57 refs.

Preliminary results of 8-year investigations from the surroundings of Bellingshausen Station are presented and compared to published data. The relationships between number of breeding pairs or breeding success and the increasing anthropogenic influences (newly built air strip and stations) were assumed. Until 1981 the number of breeding pairs of *Pygoscelis antarctica* shows increasing tendencies, but after 1981 a decrease could be assumed. From 1984/85 to 1985/86 the number of breeding *Macronectes giganteus* decreased in the southern parts of Fildes Peninsula more than 40%, but was stable in an undisturbed colony. In 1983/84 and 1984/85 the reproductive success of *Sterna vittata* in undisturbed colonies was seven times higher than in the surroundings of the air strip and diesel tanks. In the breeding place Stigant Point (which did not exist in 1966) the abundance of *Arctocephalus gazella* increased from 213 (1971) to 358 (1984).

B-43652

Hulley, P.A., Duhamel, G., **Report on prelevements RMT: fishes, Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer**, Apr. 1990 No.86-04, p.80-89, 15 refs.

In view of the fact that the St. Paul-Amsterdam region may represent an important biogeographical crossroad, the aims of the mesopelagic survey reported here were to establish the species complexity of the region, and to ascertain where an "island-mass" effect was evident. About 4200 mesopelagic fishes were obtained from 23 RMT hauls, comprising 23 families and more than 47 genera. Details of the preliminary taxonomic identifications of the fishes are tabulated; Lanternfishes are represented by 485 specimens. It is concluded that the mesopelagic ichthyofauna of the region in winter represents a continuum of the species complexity of the eastern South Atlantic and stresses the circumglobal, zonal nature of the distributional patterns which are characteristic for the area of, and south of, the Subtropical Convergence.

B-43653

Zibrowius, H., **Stylasteridae and Scleractinia corals, and serpulid polychetes, collected during the MD 50 expedition to Saint Paul and Amsterdam Islands** [Rapport préliminaire sur les coraux Stylasteridae et Scleractinia et les polychètes Serpulidae récoltes lors de la campagne MD 50 aux îles Saint Paul et Amsterdam], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Apr. 1990 No.86-04, p.93-97, In French. 11 refs.

Of the few Stylasteridae collected around Saint Paul and Amsterdam Islands, 4 genera are represented: *Conopora*, *Crypthelia*, *Errina* and *Lepidotheca*. In the larger collection of Scleractinia, 22 genera are identified, of which the genus *Caryophyllia* alone is represented by at least 4 species. Their parasites and distribution are discussed. It is noted that 7 species, generally living at bathyal depths and found at Saint Paul and Amsterdam Islands, are also common to the northeastern Atlantic as well as other sectors of the Indian Ocean. A list is also provided of the serpulid polychetes identified, noting the absence of the genera *Ditrupa* and *Hydroides*. The geographic and vertical distribution of the polychetes is discussed.

B-43654

Duhamel, G., **Demersal ichthyology** [Ichtyologie démersale], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Apr. 1990 No.86-04, p.108-113, In French.

An ichthyological survey carried out in July 1986 around Saint Paul and Amsterdam Islands during the MD50/JASUS expedition resulted in the capture of 311 specimens representing 38 species. Tables listing the numbers of specimens collected and their family, genus and species are presented. It is suggested that, based on the material collected, a taxonomic revision of the ichthyofauna of the two islands is needed.

B-43655

Saldanha, L., Almeida, A., Ledoyer, M., Ré, P., **Operations carried out in the crater of Saint Paul I. during the MD 50/JASUS expedition** [Opérations réalisées dans le cratère de l'île Saint-Paul au cours de la campagne MD 50/JASUS], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Apr. 1990 No.86-04, p.121-126, In French.

An outline is presented of operations related to a study of benthic populations—carried out July 11-23, 1986, by diving biologists—of the hard and loose substrata in 10 evenly subdivided areas of the Saint Paul I. crater. Included were the Secchi water transparency, temperature and salinity measurements at different depths, as well as meteorological observations. Some tabulated results are shown.

B-43656

Saldanha, L., Almeida, A., Ledoyer, M., Ré, P., **Benthic zonation of the Saint Paul I. crater** [Aspects de la zonation benthique dans le cratère de l'île St-Paul], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Apr. 1990 No.86-04, p.127-131, In French. 3 refs.

Findings are presented of an investigation carried out in the Saint Paul I. crater, having a diameter of 1000 m, filled with sea water 60 m deep, and connected with the Indian Ocean by a passage 80 m long. The benthic populations of the hard substratum present a homogeneous distribution. Algae occur at depths down to 5-8 m; the corals are dominant in the first 2 m layer; a small number of species of Porifera and Mollusca are found at depths down to 40 m. The ichthyofauna is quantitatively abundant and similar to that outside of the crater.

B-43659

Bosch, I.M., **Reproduction and development of shallow water asteroids and an echinoid in McMurdo Sound, Antarctica**, Santa Cruz, University of California, 1989, 112p., University Microfilms order No.89-16182, Ph.D. thesis. Refs. p.95-100.

Described are the reproduction and development of 4 asteroid species and one common echinoid that occur in shallow waters of McMurdo Sound. Of the 15 echinoderms studied, 2 brood embryos and have no larva, 1 has demersal non-feeding larvae, 4 have pelagic feeding larvae (e.g. the echinoid *Sterechinus neumayeri*) and 9 have pelagic non-feeding larvae. Embryos and larvae of 7 species were reared in laboratory cultures and 2 novel asteroid larval types were observed. Development was extremely slow, whether in natural larval populations or in well-fed laboratory cultures, and showed no evidence of temperature adaptation. Since adults of all 4 planktotrophic species studied spawn in the spring and early summer, their planktonic larvae must feed during months when appropriate phytoplankton food is scarce or absent. Nonetheless, development rates in natural populations were comparable to rates observed in laboratory cultures. The growth and survival of planktonic larvae under these conditions suggests they are not food-limited. It is proposed that low

temperature, by its rate-limiting effect on development, may have a greater impact than malnutrition on the survivorship of planktotrophic larvae and on the evolution of reproductive mode in polar seas. (Auth. mod.)

B-43660

Berkman, P.A., **Ecology of the circumpolar antarctic scallop, *Adamussium colbecki* (Smith, 1902)**, Narragansett, University of Rhode Island, 1988, 215p., University Microfilms order No.89-13018, Ph.D. thesis. Refs. passim.

The antarctic scallop, *Adamussium colbecki* (Smith, 1902), is relevant to several areas of ecology. *A. colbecki* has a circumpolar distribution from 3 to nearly 1500 m depth and can be used to compare nearshore and deep sea habitats. It has abundant nearshore populations which remain unexploited and are valuable in the development of living resource conservation strategies. At New Harbor, the size frequency distribution and biomass of *A. colbecki* have remained relatively unchanged during this decade and may provide a basis for assessing the stability of this population. Seasonal meltwater production from the sea ice and glaciers surrounding New Harbor can influence the growth, recruitment, movement and survival of *A. colbecki* during the austral summer. The relative zonation of *A. colbecki* populations, along with other antarctic nearshore benthic assemblages, may be related to changes in the volume of meltwater produced along the continental margin of Antarctica over time scales from hundreds to thousands of years. *A. colbecki* may be a relict species in the southern ocean and a window into the evolution of the antarctic benthos. (Auth.)

B-43664

Karentz, D., **Ecological considerations of antarctic ozone depletion**, *Antarctic science*, Mar. 1991 3(1), p.3-11, Refs. p.10-11.

Associated with ozone depletion is an increase in the levels of biologically harmful ultraviolet-B (UV-B) that reach the earth's surface, a situation that has prompted much controversy about the ecological effects of this atmospheric phenomenon on antarctic ecosystems. A major hindrance to assessing the ecological impact is lack of appropriate data on antarctic systems before the present ozone depletion cycle began. In addition, certain physical features of the antarctic environment (clouds, snow and ice) and the UV-B photobiology (repair processes and protective strategies) of endemic species can alter the potential biological effects of this environmental stress in as yet undetermined ways. Increases in incident UV levels will most likely result in changes in the taxonomic structure of communities. The effects of these changes on net productivity and trophic dynamics cannot be accurately assessed without quantifying ambient doses of UV and characterizing the UV photobiology of individual species. Both the physical features of the springtime environment and the biological responses of endemic species must be considered in future research efforts to evaluate the biological consequences of the antarctic ozone hole. (Auth.)

B-43665

Armstrong, A.J., Siegfried, W.R., **Consumption of antarctic krill by Minke whales**, *Antarctic science*, Mar. 1991 3(1), p.13-18, 36 refs.

The consumption of krill (*Euphausia superba*) by an average-sized (male 6994 kg; female 8249 kg), sexually mature Minke whale (*Balaenoptera aculorostrata*) was estimated, from stomach capacity, ingestion rate and respiratory allometry methods. Estimates obtained from the stomach capacity and respiratory allometry methods differed by 17%-23%. An average-sized male Minke whale consumes 37.2 t of krill during a 90-day stay, and an average-sized female consumes 56.2 t of krill during a 120-day stay, in antarctic waters during the

austral summer. It is estimated that the Minke whale population in the Antarctic (60S and higher) consumes 35.5 million t of krill annually. (Auth.)

B-43666

Arnould, J.P.Y., Whitehead, M.D., **Diet of antarctic petrels, cape petrels and southern fulmars rearing chicks in Prydz Bay, *Antarctic science***, Mar. 1991 3(1), p.19-27, Refs. p.26-27.

The breeding season diet of the three surface-nesting petrel species on the Rauer Is., Prydz Bay were examined. The stomach contents of cape petrel (*Daption capense*), antarctic petrel (*Thalassoica antarctica*), and southern fulmar (*Fulmarus glacialis*) were sampled by collecting regurgitates and by stomach flushing during the 1987/88 early chick-rearing period. *Pleuragramma antarcticum* and *Euphausia superba* dominated the diets of all species. By mass they constituted 78% and 22% of antarctic petrel diet, 63% and 36% of southern fulmar diet, and 14% and 85% of cape petrel diet respectively. *P. antarcticum* increased in importance in the diet of antarctic petrels during the course of the study, while *E. superba* became increasingly important in the diets of southern fulmars and cape petrels. Previous studies conducted during incubation consistently reported the diets as comprising chiefly cephalopods and euphausiids, whilst studies during chick-rearing have reported fish and euphausiids dominating, and very little cephalopod material. (Auth.)

B-43667

Batram, J.C., Johnston, I.A., **Muscle growth in the antarctic teleost, *Notothenia neglecta* (Nybelin), *Antarctic science***, Mar. 1991 3(1), p.29-33, 36 refs.

A histochemical and electron microscopy study was carried out on muscle growth in demersal stages of the antarctic teleost *Notothenia neglecta* Nybelin. The total number of myotomal muscle fibers was similar in fish ranging in body mass from 11.9 g to 889 g. Post-anal myotomes contained around 17,000 slow muscle fibers and 70,000 fast muscle fibers. Myosatellite cells were extremely rare. The diameter of fast fibers varied from <10 micron to 130 micron in the smallest, and from >40 micron to 450 micron in the largest fish studied. Slow muscle fiber diameters in the largest fish ranged from >30 micron to 260 micron. Even the largest diameter slow fibers contained significant numbers of mitochondria, which suggests that the diffusion of oxygen does not limit metabolism. The results confirm that muscle fiber hyperplasia ceases prior to the demersal stages of the life history, and that subsequent muscle growth is entirely via the hypertrophy of existing fibers. Comparative studies suggest that this may be one of the factors contributing to the relatively slow rate of somatic growth in this species. (Auth.)

B-43668

Broady, P.A., Kibblewhite, A.L., **Morphological characterization of Oscillatoriales (Cyanobacteria) from Ross Island and southern Victoria Land, Antarctica, *Antarctic science***, Mar. 1991 3(1), p.35-45, 31 refs.

Field populations of Oscillatoriales, from fresh and saline lakes and ponds, and from terrestrial habitats, are characterized on the basis of their morphology and morphometry. Fifteen morphotypes are recognized principally from the following characteristics: cross-sectional shape of the trichome, presence or absence of a calyptra on the apical cell, occurrence or otherwise of numerous trichomes within a common sheath, and trichome width distribution. The following traditional species are described: *Lyngbya murrayi*, *Microcoleus vaginatus*, *Oscillatoria deflexa*, *O. Koettlitzii*, *O. priestleyi*, *O. sancta*, *Phormidium autumnale* and *P. subproboscidea*. Intraspecific morphotypes of *M. vaginatus*, *O. priestleyi* and *P. autumnale* are recognized on the basis of trichome width. A new species and variety of *Crinalium* (Crow) Winder, Stal & Mur, a genus characterized by flattened trichomes, are described from cryoconite ponds on glaciers.

C. glaciale sp. nov. possesses wide, straight trichomes in contrast to *C. glaciale* var. *heliocoides* nov. var. in which trichomes are narrower and helically coiled. (Auth. mod.)

B-43669

Maki, J.S., Herwig, R.P., **Diel study of the neuston and plankton bacteria in an antarctic pond, *Antarctic science***, Mar. 1991 3(1), p.47-51, 23 refs.

A small freshwater pond near Palmer Station, Anvers I., was sampled every 6 h over a 24 h period during the late austral summer to examine changes in both neuston and plankton population levels and activity. Total bacteria from acridine orange and epifluorescence microscopy, counts of viable colony-forming units, and chlorophyll *a* were determined. Activity was estimated by measuring the rate of H-3-thymidine incorporation. The data indicate that over this time period the bacterioneuston populations went through a diel fluctuation, and temperature may be an important factor in this cycle. Although the bacterioneuston populations were often more numerous than corresponding plankton populations, subsurface bacteria appeared to be metabolically more active. (Auth.)

B-43670

Minto, L.B., Shepherd, G.J., Usher, M.B., **Cryptostigmatid mite *Halozetes belgicae* (Michael) in the maritime Antarctic, *Antarctic science***, Mar. 1991 3(1), p.53-59, 8 refs.

Halozetes belgicae is distributed widely in the Subantarctic and maritime Antarctic, with subspecies described from Macquarie I. and the South Sandwich Is. A morphometrical study, based largely on the development of the setae, indicates that the nominate subspecies is confined to the Antarctic Peninsula and its offshore islands (including the South Shetland Is.), whilst specimens from the South Orkney Is. are probably consubspecific with individuals on the South Sandwich Is. In comparison with other studies of the Acari, the results strengthen the case for the recognition of a South Orkadian biogeographical zone. (Auth.)

B-43675

Vosjan, J.H., Döhler, G., Nieuwland, G., **Effect of UV-B irradiance on the ATP content of microorganisms of the Weddell Sea (Antarctica), *Netherlands journal of sea research***, 1990 25(3), p.391-393, 12 refs.

The effect of UV-B irradiation on the ATP content of natural assemblages of planktonic microorganisms in the upper 30-m water layer of the Weddell Sea was studied. After five hours of irradiation with UV (290-320 nm) of 1.35 W/sq m, a 75% decrease in the ATP content of the microorganisms was observed. (Auth.)

B-43676

Nicol, S., Stolp, M., **Molting, feeding, and fluoride concentration of the antarctic krill *Euphausia superba* Dana, *Journal of crustacean biology***, Feb. 1991 11(1), p.10-16, 16 refs.

A series of experiments was carried out to examine the relationship between feeding, molting, and fluoride content in antarctic krill (*Euphausia superba*). Starvation increased the intermolt period in krill, but had no effect on the fluoride concentration of the molts produced. Addition of excess fluoride to the sea water had no direct effect on the intermolt period, the molt weight, or molt size. Additions of 6 microgram/l and 10 microgram/l fluoride raised the fluoride concentrations of the molts produced and of the whole animals. The whole body fluoride content varied cyclically during the molt cycle, reaching a peak 6 days following ecdysis. Fluoride loss at ecdysis could largely be explained by the amount of this ion shed in the molt. (Auth.)

B-43680

Wang, Y., Wu, B., **Preliminary report on the pelagic polychaetes from the South Shetland Islands, Biscoe Islands and their vicinities**, *Antarctic research*, Dec. 1990 1(1), p.20-26, 17 refs.

Preliminary results are reported of investigations carried out on specimens collected by the First Chinese Antarctic Expedition on Feb. and Mar., 1985, around the South Shetlands and Biscoe Is. Eight species belonging to 5 genera in 4 families have been identified, of which 4 species, *Maupasias coeca* Viguiet, *Rhynchonerella petersii* (Langerhans), *Rhynchonerella bongraini* (Gravier) and *Tomopteris planktonis* Apstein, are recorded for the first time from the South Shetland Is., and 2 species, *Rhynchonerella bongraini* (Gravier) and *Tomopteris carpenteri* Quatrefages, are endemic species of Antarctica. (Auth. mod.)

B-43686

Rheeder, J.P., Van Wyk, P.S., Marasas, W.F.O., ***Fusarium* species from Marion and Prince Edward Islands: sub-antarctic**, *South African journal of botany*, Aug. 1990 56(4), p.482-486, With Afrikaans summary. 18 refs.

Fusarium species were isolated from plant debris in 27 soil samples representing the major habitat and vegetation types of Marion and Prince Edward Is. The survey provided qualitative and quantitative information on the occurrence, distribution and ecology of *Fusarium* spp. in these subantarctic soils and appears to be the first report of *Fusarium* spp. from the subantarctic. Altogether 432 *Fusarium* isolates were recovered after plating plant debris on a selective medium. The most prevalent *Fusarium* sp. which comprised 73% of the isolates obtained from Marion I. and 82% of the isolates from Prince Edward I., was *F. merismoides* Corda. Two other species (*F. acuminatum* Ell. & Ev. and *F. reticulatum* Mont.) occurred at similar frequencies to each other, and were more prevalent in areas that were influenced by animal and bird activity. A number of *F. reticulatum* isolates were obtained from isolations made from necrotic leaf tissue of *Pringlea antiscorbutica* R. Br. (Auth.)

B-43688

Hindell, M.A., **Some life-history parameters of a declining population of southern elephant seals, *Mirounga leonina***, *Journal of animal ecology*, Feb. 1991 60(1), p.119-134, 46 refs.

Mark-resight data were analyzed for thirteen cohorts from a declining population of southern elephant seals branded at Macquarie I. between 1951 and 1965. First year survival was essentially stable during the 1950s at about 46% for females and 42% for males. There was a dramatic fall in first year survival during the 1960s, declining to less than 2% for both sexes in 1965. Post-year-1 survival did not change between the 1950s and the 1960s. Comparisons with a stable population of southern elephant seals at South Georgia indicated that both first year and adult survival were lower in the Macquarie I. population. There were no changes in the age at first breeding of the Macquarie I. seals during the study, but this was on average 1 year later than at South Georgia. It is hypothesized that the current decline in elephant seal numbers at several of their major breeding islands is due to the populations returning to pre-sealing levels after they had risen to abnormally high levels with the end of commercial exploitation early this century. Possible tests of the hypothesis include studying the diet and foraging behavior of southern elephant seals to gain an understanding of the predator-prey relationships, continuing to census the Macquarie I. population to determine if the population levels out at around the estimated pre-sealing levels, and monitoring northern elephant seal populations which were also severely exploited but are currently increasing rapidly. (Auth.)

B-43710

Kellermann, A., ed, **Identification key and catalogue of larval antarctic fishes**, *Berichte zur Polarforschung*, 1990 No.67, 136p., Refs. passim. For individual papers see B-43711 and B-43712.

This booklet has two complementary parts: an identification key which attempts to include larvae from all fish families occurring in the southern ocean, and a catalogue which considers only the early stages of the most abundant bottom dwelling fishes, the percomorph notothenioid fishes. It intends to produce a synopsis of what is known about the larval development and ecology of notothenioid fishes as the peculiar element of the antarctic fish fauna. It was suggested during the BIOMASS Post-SIBEX Fish Data Evaluation Workshop held at Cambridge, 1986, to have both a key and a catalogue in one volume, with the key to be produced in collaboration with the British Antarctic Survey. This idea was further enhanced by the growing interest of CCAMLR to develop new approaches for the conservation of the antarctic fish fauna. The key and catalogue are by no means complete and must be regarded as working documents. It is hoped that they will be complemented by future efforts of the international community. (Auth. mod.)

B-43711

North, A.W., Kellermann, A., **Key to the early stages of antarctic fish**, *Berichte zur Polarforschung*, 1990 No.67, p.1-44, 33 refs.

A new field key has been produced to 58 species of antarctic fish larvae. Other identifications are given to genera or type. Pigmentation is the main character used for discrimination in the key which permits rapid field identification, rather than counts of fin-rays, myomeres and other characteristics. However, in some cases species could not be separated easily by pigmentation and so a more detailed examination and such counts are used where necessary. (Auth.)

B-43712

Kellermann, A., **Catalogue of early life stages of antarctic notothenioid fishes**, *Berichte zur Polarforschung*, 1990 No.67, p.45-136, Refs. p.134-136.

The catalogue includes the early stages of 42 antarctic species of the percomorph suborder of notothenioid fishes from the Atlantic sector of the southern ocean. For each species the pigmentation pattern and larval development are described and illustrated with drawings. Information is presented on the spatial and temporal occurrence and, where available, on the food of the pelagic stages. The distinguishing characteristics of similar and co-occurring larvae of other fishes are listed for each species. A brief summary of the main features of their development and ecology is provided and discussed, with some conclusions. (Auth.)

B-43713

Hein, S., **Benthic seashells (Gastropoda and Bivalvia) of the Weddell Sea, Antarctica** [Die beschalten benthischen Mollusken (Gastropoda und Bivalvia) des Weddellmeeres, Antarktis], *Berichte zur Polarforschung*, 1990 No.70, 181p., In German with English summary. Refs. p.105-112.

This study is a monograph-like taxonomical inventory of the benthic seashells (Gastropoda & Bivalvia) of the eastern Weddell Sea. The survey is based on the analysis of 75 trawl samples. Living animals of 93 gastropod and 39 bivalve species were obtained for the study. As in other parts of the antarctic ocean, the systematical diversity of the eastern Weddell Sea mollusks is remarkably high. The 93 gastropod species belong to at least 24 families and 48 genera while the 39 bivalve species belong to 16 families and 23 genera. Each species is documented by synonym lists and systematical notes, as well as morphological descriptions and figures of the shell. Gastropod radula morphology is shown by SEM-photographs. The geographical distribution is derived from literature data. The bathymet-

rical distribution range of some species is expanded by the author's data. Remarks regarding the biology of the species summarize the knowledge available in the literature. The biology of many species is unknown or poorly known due to studies of preserved material. Results of long-term observations of specimens kept alive in aquaria at the Alfred-Wegener-Institute provide comments on behavior, nutrition and reproductive strategies for several species. Figures of diagnostic characters, a glossary of terms used in malacology and keys for all gastropod and bivalve species represented in the material enable even 'non-specialists' to identify the benthic seashells from the eastern Weddell Sea. (Auth. mod.)

B-43716

Odening, K., **Parasitological problems in Antarctica** [Parasitologische Probleme in der Antarktis], *Milu*, 1985 6(1/2), p.129-136, In German with English and German summaries. 30 refs.

The main tasks of parasitological research in the Antarctic at present are: completion of the survey of metazoan parasites (helminths and arthropods) including actual taxonomic revisions; faunistic and zoogeographic analyses and generalizations; studies on the adaptation of parasites to extreme temperatures; elucidation of developmental cycles; research on synecology and populations; and exploration of the parasitic protozoans of the region. (Auth.)

B-43735

Taylor, R.H., **Records of subantarctic fur seals in New Zealand**, *New Zealand journal of marine and freshwater research*, 1990 24(4), p.499-502, 29 refs.

Subantarctic fur seals (*Arctocephalus tropicalis*) appear as stragglers on New Zealand coasts. Four records are noted, the most recent at Antipodes I. in Dec. 1989. (Auth.)

B-43742

Kurbjewit, F., Ali-Khan, S., **Distribution and abundance of planktonic copepods (Crustacea) in the Weddell Sea in summer 1980-81**, *Berichte zur Polarforschung*, 1990 No.72, 53p., 25 refs.

Calanoid copepods from hauls to about 250 m depth taken in summer 1980/81 in the inner Weddell Sea (particularly off the Filchner Ice Shelf in the south and Atka Bay in the northeast) were identified and counted. Abundance along the Ice Shelf was very low compared to Atka Bay, although diversity was not significantly different. In the former area, older copepodids and adults of *Metridia gerlachei* were most abundant, whereas the water off Atka Bay was dominated by young copepodids of *Calanoides acutus* and *Calanus propinquus*. Low abundance of calanoids in the southern Weddell Sea might be caused by the short summer seasons, as well as unfavorable hydrography. (Auth.)

B-43745

Karsten, U., **Ecophysiological investigation on the salinity and temperature tolerance of antarctic green algae with an emphasis on beta-dimethylsulphoniopropionate (DMSP) metabolism** [Ökophysiologische Untersuchungen zur Salinitäts- und Temperaturleranz antarktischer Grünalgen unter besonderer Berücksichtigung des Beta Dimethylsulphoniumpropionat (DMSP)-Stoffwechsels], *Berichte zur Polarforschung*, 1991 No.79, 108p., In German with English summary. Refs. p.93-108.

The influence of the abiotic factors temperature, light and salinity on growth and photosynthesis/respiration of the eulitoral antarctic green algae *Ulothrix implexa*, *Ulothrix subflaccida*, *Enteromorpha bulbosa* and *Acrosiphonia arcta* was investigated. Data obtained were compared with those of the subantarctic-cold temperate green alga *Ulva rigida*. Emphasis was put on the ability of all species to os-

moacclimatise following hypo- and hypersaline shocks. Therefore, all osmotic active substances including cations, anions and organic substances were analyzed and quantified. The effects of photon concentration, day length and temperature on the intracellular DMSP content of the antarctic/subantarctic green algae were also investigated. (Auth. mod.)

B-43756

Wanless, S., Harris, M.P., **Diving patterns of full-grown and juvenile Rock Shags**, *Condor*, Feb. 1991 93(1), p.44-48, 14 refs.

Information on diving patterns was obtained for full-grown and juvenile Rock Shags (*Palacrocorax magellanicus*) feeding in Port Stanley Harbour, Falkland Is. Birds dived mainly in, or just outside, beds of giant kelp within 50 m of the shore where the water depth varied from 1-6 m. Mean dive and recovery times were 28 sec and 10 sec respectively, diving rate was 1.8 dives/min and birds spent 75% of the time underwater. Full-grown and juvenile birds both showed a highly significant positive relationship between dive time and water depth. Full-grown individuals also showed a significant increase in recovery time with increasing dive time, but for juveniles recovery time was independent of dive time. This resulted in full grown birds attaining a rate of diving that was 30-50% higher than that of juveniles in shallow water. (Auth.)

B-43757

Karsten, U., Wiencke, C., Kirst, G.O., **Growth pattern and beta-dimethylsulphoniopropionate (DMSP) content of green macroalgae at different irradiances**, *Marine biology*, Feb. 1991 108(1), p.151-155, 22 refs.

Growth rates and intracellular beta-dimethylsulphoniopropionate (DMSP) concentrations of five green algal species collected from different geographic regions in 1986 and 1989 were determined under four photon flux rates. In *Ulothrix implexa*, *U. subflaccida* and *Acrosiphonia arcta* from Antarctica, growth was light-saturated at lower irradiances than in temperate *Ulva rigida* from southern Chile and *Blidingia minima* from Germany. The DMSP content of *Ulothrix implexa*, *A. arcta* and *Ulva rigida* was directly correlated with the light factor: with increasing irradiance, algal DMSP level increased. In contrast, in *Ulothrix subflaccida* and *B. minima* DMSP concentrations gradually decreased up to a photon flux rate of 30 micro-mol/sq m/s, then increased markedly under the highest photon flux rate tested. In non-growing, dark-incubated *A. arcta* DMSP content was reduced by 35%, while the DMSP pool of all other species remained unchanged, at the level of pre-culture conditions. Under full darkness all plants exhibited a significantly higher DMSP concentration compared with algae grown at low photon flux rates of 2 to 30 micro-mol/sq m/s. These data show a correlation between growth pattern and DMSP biosynthesis, and may point to a species-specific minimum amount of light energy necessary for DMSP accumulation. (Auth.)

B-43758

Karentz, D., McEuen, F.S., Land, M.C., Dunlap, W.C., **Survey of mycosporine-like amino acid compounds in antarctic marine organisms: potential protection from ultraviolet exposure**, *Marine biology*, Feb. 1991 108(1), p.157-166, Refs. p.165-166.

To investigate the natural defenses of antarctic marine organisms against exposure to ultraviolet (UV) radiation (280 to 320 nm), 57 species (1 fish, 48 invertebrates, and 8 algae) were collected during austral spring 1988 in the vicinity of Palmer Station (Anvers Island). These were analyzed for the presence of mycosporine-like amino acids (MAAs), compounds that absorb UV radiation and may provide shielding from these biologically hazardous wavelengths. Nearly 90% of the 57 species examined contained MAAs, and eight specific

MAA compounds were identified. Seven of these (palythine, porphyrin-334, shinorine, mycosporine-glycine, palythene, asterina-330, and palythanol) have been observed previously in marine organisms from temperate and tropical latitudes. A new MAA, mycosporine-glycine: valine, was found in the antarctic fish and in 38 of the invertebrate species examined. This study confirms widespread occurrence of MAAs in antarctic marine organisms, and suggests that these species have some degree of natural biochemical protection from UV exposure. (Auth.)

B-43764

Zaneveld, J.S., **Cyanophyta of the Ross Sea islands and coastal Victoria Land, Antarctica**, Koenigstein, Sven Koeltz Scientific Books, 1988, 85p., Refs. p.57-66.

Taxonomic and ecological studies carried out in the Ross Sea region between 1963 and 1967 showed the presence of 3 coccoid, 3 heterocystous oscillatoroid, and 6 non-heterocystous oscillatoroid blue-green algal taxa. In the antarctic region studied, the most suitable habitats for the growth and development of blue-green algae during the summer are the pools, ponds and lakes, their outflow streams, and the glacial meltwater streams containing fresh to saline water, either with or without an ice cover. Cyanophyten flora also grew well on and in moist soils surrounding these aquatic habitats, as well as on snow and ice, and as undercoatings of large pebbles. A striking feature of these habitats is the presence of extensive benthic feltlike mats, formed primarily by non-heterocystous filamentous cyanophyten populations but sometimes mixed with one or more chlorophyten species. The abundant presence of orange-red carotenoids in the surface layer of these mats protect the algae against overly intensive insolation. The conclusion may be that these mat-forming algal populations are modern stromatolite builders. (Auth. mod.)

B-43766

D'Avino, R., Camardella, L., Carratore, V., Di Prisco, G., **Amino acid sequence of the α chain of Hb 2 completes the primary structure of the hemoglobins of the antarctic fish *Notothenia coriiceps neglecta***, *Comparative biochemistry and physiology*, 1990 97B(4), p.803-807, 26 refs.

The blood of *Notothenia coriiceps neglecta*, a cold-adapted notothenioid fish, widely distributed in antarctic waters, and characterized by a relatively low content of erythrocytes and hemoglobin, contains two hemoglobin components, Hb 1 and Hb 2; the amino acid sequences of the β chain of Hb 1 and Hb 2 are identical. The amino acid sequence of the α chain of Hb 2 has been established, thus completing the elucidation of the primary structure of the two hemoglobins. (Auth.)

B-43767

Faleeva, T.I., Gerasimchuk, V.V., **Features of reproduction in the antarctic sidestripe, *Pleuragramma antarcticum* (Nototheniidae)**, *Journal of ichthyology*, 1990 30(5), p.67-79, Translated from Voprosy ikhtiologii 30(3), 1990. Refs. p.77-79.

The results of histological research on the sex organs of the antarctic sidestripe are reported. At the end of the summer season, oogenesis and spermatogenesis are far from completion. Spawning presumably occurs at the end of winter. Based on the structural features of resorbing oocytes, it is concluded that the eggs are pelagic. A description of the gonads is presented with a view to improving the accuracy of visual determinations of maturity stages. A relationship is postulated between the developmental dynamics of stationary polynyas and spawning success in the antarctic sidestripe. (Auth.)

B-43769

Capelli, R., De Pellegrini, R., Minganti, V., Amato, E., **Preliminary results on the study and determination of total and organic mercury in marine organisms sampled during the scientific antarctic campaign 1987/88**, *Annali di chimica*, 1989 79(11-12), p.561-569, 5 refs.

During the 1987-1988 Italian expedition to Antarctica, two species of marine organisms, (*Adamussium colbecki* and *Pagothenia bernacchii*) were collected at various sites of Terra Nova Bay. Samples were analyzed for organic and total mercury by means of cold vapor atomic absorption spectrometry (CVAAS). Preliminary results show, in the case of *Pagothenia bernacchii*, an average of total mercury of 0.290 microgram/g, fresh weight, with 70% organic mercury, whereas for *Adamussium colbecki* the mercury content is lower, with an average of total mercury of 0.026 microgram/g, fresh weight and with 24% organic mercury. No correlation seems to exist in either organism between mercury and size, sex and site of sampling. (Auth.)

B-43801

Wilson, R.P., Culik, B., Adelung, D., Coria, N.R., Spairani, H.J., **To slide or stride: when should Adélie penguins (*Pygoscelis adeliae*) toboggan**, *Canadian journal of zoology*, Jan. 1991 69(1), p.221-225, 20 refs.

Adélie penguins (*Pygoscelis adeliae*), when travelling over snow both walking and tobogganing, reduced stride length and stride frequency, and thus speed, with increasing uphill gradient, although tobogganing birds travelled faster and with fewer leg movements. The incidence of tobogganing increased with decreasing friction between penguin and snow. The percentage of penguins tobogganing was also highly positively correlated with increasing snow penetrability. Penguins walking on soft snow must expend additional energy to pull their feet through the snow, whereas tobogganing birds do not sink. It is to be expected that Adélie penguins would utilize the most energetically favorable form of travel which, under almost all conditions, appeared to be tobogganing. Although tobogganing appears to be energetically more efficient than walking, rubbing the feathers over snow increases the coefficient of friction in unpreened plumage. The authors propose that a high incidence of tobogganing necessitates increased feather care and that the decision whether to walk or toboggan probably represents a balance between immediate energy expenditure and subsequent energy and time expended maintaining plumage condition. (Auth.)

B-43802

Torley, P.J., Ingram, J., Young, O.A., Meyer-Rochow, V.B., **Salt-induced, low-temperature setting of antarctic fish muscle proteins**, *Journal of food science*, Jan.-Feb. 1991 56(1), p.251-252, 21 refs.

Freshly prepared salted pastes (2.5%, w/w NaCl) of muscle tissue of the antarctic fishes *Pagothenia borchgrevinki* (white muscle) and *Dissostichus mawsoni* (red and white muscle) rapidly formed cold-set gels. Set times were minutes rather than the hours required to cold-set salted pastes of fish from cold-temperate waters. Cold-setting was related to habitat temperature and the stability of fish muscle myosin, the protein responsible for gel formation. (Auth.)

B-43803

El-Sayed, S.Z., ed, **Biological Investigations of Marine Antarctic Systems and Stocks**. BIOMASS newsletter, Vol.12, No.1, College Station, Texas A and M University, July 1990, 16p.

This issue contains excerpts prepared for the BIOMASS Executive on the future of the BIOMASS Data Centre regarding its current situation, major issues to be addressed and the overall strategy for information management adopted by SCAR; two articles (on biologi-

cal and global-change issues) presenting some of the major activities and recommendations of SCAR Working Groups meeting held in Sao Paulo, Brazil, July 16-27, 1990; the BIOMASS Correspondent report on investigations by South Africa, the Soviet Union, the United States and the Federal Republic of Germany on new acoustic data systems, krill, seals and penguins, and the RV *Meteor* activities, respectively; a brief account of the cooperative research by F.R.G. and U.S.S.R. in the Weddell Sea Gyre; an article on the elected President of SCAR, Dr. R.M. Laws; a review of results of the first measurements of ultraviolet penetration ever conducted in the southern ocean; summary of activities at the Conference on Biology of Antarctic Fishes, held at Ravello, Italy, May 30-June 1, 1990; book reviews; miscellaneous news; and a list of meetings to be held in 1990-1991.

B-43804

El-Sayed, S.Z., ed, **Biological Investigations of Marine Antarctic Systems and Stocks. BIOMASS newsletter, Vol.12, No.2**, College Station, Texas A and M University, Dec. 1990, 16p.

This issue contains an overview of the Joint Global Ocean Flux Study, its objectives, research plans and its connection with BIOMASS; an account of the CCAMLR Krill Working Group meeting, held in Leningrad, U.S.S.R., Aug. 27-Sep. 3, 1990; news from the BIOMASS Data Centre; a brief summary of the Southern Ocean Ecology Group meeting, held in Trondheim, Norway, May 21-23, 1990, including a discussion on research programs for the Antarctic Sea-Ice Zone; The BIOMASS Correspondent report on activities carried out by Australia, the U.K., Poland, Japan, Germany, Finland and Belgium; SIBEX Physical Oceanography Workshop highlights, including some results from the Bransfield Strait, the Drake Passage and Prydz Bay; an obituary for Professor Takahisa Nemoto; miscellaneous news, book reviews, and a list of meetings to be held in 1991.

B-43811

Daly, K.L., **Overwintering development, growth, and feeding of larval *Euphausia superba* in the antarctic marginal ice zone**, *Limnology and oceanography*, Nov. 1990 35(7), p.1564-1576, 58 refs.

An investigation of the marginal ice zone in winter took place in the Scotia-Weddell Seas, a major nursery ground for the antarctic krill. Krill larvae were abundant at the ice edge and on the undersurfaces of ice floes where the pack ice provided greater concentrations of food and a superior refuge compared to the water column. Larval development and growth, which is dependent on food supply, progressed steadily from June through Aug. In early June, furcilia stages F3-F5 were most abundant but by Aug., F6s and juveniles predominated. Krill molted about every 20 d and growth rates, 0.07 mm/d, were similar to reported summer rates. Gut fullness indicated that 98% of the larvae were feeding both day and night. Ingestion rates based on gut pigments, however, were inadequate to meet respiratory requirements. Dietary analysis revealed that in addition to diatoms, larvae ingest protozoans and possibly detritus. If heterotrophic C is considered, larval krill feeding on sea ice biota could ingest sufficient C to support observed growth. Seasonal pack ice coverage over nursery grounds thus plays an important role in the overwintering of larval krill. (Auth.)

B-43819

Woehler, E.J., Hodges, C.L., Watts, D.J., **Atlas of the pelagic distribution and abundance of seabirds in the southern Indian Ocean, 1981 to 1990**, *Australian National Antarctic Research Expeditions. ANARE research notes*, Sep. 1990 No.77, 406p., 11 refs.

The pelagic distributions and relative abundances of 57 taxa of seabirds (50 species and 7 species groups), comprising 38,905 records of 323,870 individuals are mapped on a monthly basis. The data were collected from research cruises and resupply vessels in the south-

ern Indian Ocean, between 60E and 160E, and between 40S and the antarctic continent. The records, collected in the 10 years 1981 to 1990, were made in all months except Aug., with the majority made in Oct. to Mar. (Auth.)

B-43822

Wilson, R.P., Spairani, H.J., Coria, N.R., Culik, B.M., Adelung, D., **Packages for attachment to seabirds: what color do Adélie penguins dislike least**, *Journal of wildlife management*, July 1990 54(3), p.447-451, 18 refs.

Black, white, blue, red, and yellow packages containing a peck pressure sensor and recorder were attached to the dorsal feathers of free-living Adélie penguins (*Pygoscelis adeliae*). Packages were left in place for up to 14 days. Black packages, which matched the background feather color, were pecked significantly less than any other color except red during 24-hour trials with incubating birds. Other colors were pecked equally. The number of pecks given to packages worn at sea was positively related to the wearing time with no evidence of habituation up to the maximum wearing period. Researchers equipping penguins with external devices will have to consider device coloration as a potentially important source of irritation to the birds. (Auth.)

B-43823

Lombardo, R.J., Ferrari, L., Vinuesa, J.H., **Effects of lindane and acetone on the development of larvae of the southern king crab (*Lithodes antarcticus* Jaquinot)**, *Bulletin of environmental contamination and toxicology*, Feb. 1991 46(2), p.185-192, 17 refs.

Lithodes antarcticus (southern king crab) is a commercially important species. The present study attempts to describe the effects of an organochlorine pesticide and the most commonly used solvent (acetone) on the early development of this species. The aims of this study were: to determine the effects of lindane on survival, development and moulting during the early larval stages of *L. antarcticus*, and to determine an incipient lethal level, corresponding to a threshold concentration, at which acute toxicity ceases. (Auth.)

B-43826

Shaughnessy, P.D., Shaughnessy, G.L., Keage, P.L., **Fur-seals at Heard Island: recovery from past exploitation?**, *Marine mammals of Australasia. Field biology and captive management*, Sydney, Australia, Royal Zoological Society of New South Wales, 1988, p.71-77., 23 refs.

DLC QL713.2.M355 1988

Heard I. is not considered to have been an important breeding station for fur-seals in the past and it has not been subject to modern commercial sealing. The Antarctic fur-seal (*Arctocephalus gazella*) breeds there currently. This paper presents counts of fur-seals at the island in the summer of 1986/87, compares the population size with earlier estimates and known harvest data, and makes an inference concerning the discovery of the island. (Auth.)

B-43827

Millay, M.A., Taylor, T.N., **New fern stems from the Triassic of Antarctica**, *Review of palaeobotany and palynology*, 1990 Vol.62, p.41-64, 36 refs.

Five new genera of filicalean fern stems are described from antarctic silicified permineralizations of early Middle Triassic age. *Antarctipteris* gen. n. stems are rhizomatous, 5-15 mm in diameter and possess an exarch protostele. Leaf traces are initially bar-shaped and become C- or V-shaped in the petiole. The stele and leaf traces are surrounded by cortical sclerenchyma strands. *Fremouwa* gen. n. is a creeping rhizome 1-4 mm in diameter which possesses an endarch, ectophloic siphonostele. C-shaped leaf traces are produced radially and migrate through the cortex obliquely. *Schleporia* gen.n. stems are 3-4 mm in diameter and possess a mesarch ectophloic siphonostele.

Branching occurs by initiation of two C-shaped xylem strands that fuse adaxially and then abaxially to form a cylinder. Leaf traces are C-shaped and distantly spaced. *Schopfiopteris* gen. n. is a creeping rhizome 1.5-11 mm in diameter which possesses an endarch, ectophloic siphonostele. Stems produce C-shaped leaf traces on one side of the stele. *Soloropteris* gen. n. stems are cylindrical, 1-4 mm in diameter, and have a mesarch amphiphloic siphonostele which produces C-shaped leaf traces. Lateral buds are axillary or adaxial to the widely spaced leaves. The stems are compared anatomically to Paleozoic filicalean ferns, and an attempt is made to suggest relationships to extant families within the Filicales. (Auth.)

B-43830

Thompson, K.R., Rothery, P., **Census of the black-browed albatross *Diomedea melanophrys* population on Steeple Jason Island, Falkland Islands, *Biological conservation*, 1991 56(1), p.39-48, 9 refs.**

The world's largest colony of the black-browed albatross *Diomedea melanophrys* on Steeple Jason I., Falkland Is. was systematically censused for the first time in Dec. 1987. Colony area was estimated as 31.8 ha from high-altitude aerial photographs. Densities of both occupied and empty nests were estimated from counts in 31 quadrats covering 2.2% of the total colony area. Combining the colony area and nest density estimates indicated a total of between 196,600 and 232,700 nests, of which between 153,200 and 178,400 were occupied by breeding pairs over the hatching period. These results confirm the importance of this colony, and of the Falklands as a whole, to the world population of this species and provide a baseline against which to assess future population changes. Population monitoring is now essential, as the foraging ecology of the albatrosses has been affected by the growth of commercial fisheries in Falklands' waters over the past decade. (Auth.)

B-43832

Egginton, S., Taylor, E.W., Wilson, R.W., Johnston, I.A., Moon, T.W., **Stress response in the antarctic teleosts (*Notothenia neglecta* Nybelin and *N. rossii* Richardson), *Journal of fish biology*, Feb. 1991 38(2), p.225-235, 31 refs.**

Blood chemistry and haematological parameters have been determined in the antarctic teleosts, *Notothenia neglecta* Nybelin and *Notothenia rossii* Richardson at 2 C. Samples were taken using chronically implanted dorsal aortic cannulae following a minimum of 24-36 h recovery. Broadly similar results were obtained for the two species. In *N. neglecta*, routinely active specimens had high values of arterial pH (7.81) and PO₂ (9.26 kPa), and modest haemoglobin levels (5.6 g d/l) relative to temperate species. Following 3 min strenuous activity there was a decrease in arterial pH (7.63) and a small rise in lactate from 0.41 to 0.68 mM, but no significant change in the calculated net metabolic acid load. PaO₂ and PaCO₂ varied inversely during exercise, and oxygen content declined by 22%. pH_a and most other haematological parameters returned to routine values between 1-3 h post-exercise. The results suggest that the major effect of strenuous activity in *Notothenia* spp. is a respiratory rather than a metabolic acidosis. (Auth.)

B-43834

Lunn, N.J., Boyd, I.L., **Pupping-site fidelity of antarctic fur seals at Bird Island, South Georgia, *Journal of mammalogy*, Feb. 1991 72(1), p.202-206, 14 refs.**

In female fur seals (*Arctocephalus gazella*), parturition and mating are separated by 6-7 days. Females are highly gregarious when ashore during the parturition-mating period, and observations of marked individuals for successive years suggest that females are faithful to particular breeding sites. The number of female fur seals that returned to the study beach in consecutive years exceeded 65% in each year of the study (1984-1988), although there was some evidence of a decline from about 80% in the first 2 years.

B-43836

Andriiashev, A.P., Prirodina, V.P., **Review of antarctic species of the genus *Careproctus* (Liparididae) and notes on the carcinophilic species of this genus, *Journal of ichthyology*, 1990 30(6), p.63-76, Translated from Voprosy ikhtiologii. Refs. p.74-76.**

A description is given of *Careproctus credispinulosus* sp. n., and a redescription of the little known *C. georgianus*, and diagnoses of three recently described species: *C. parini*, *C. steini*, and *C. continentalis*. An identification key is given to all antarctic species of the genus *Careproctus*. Consideration is given to the question of the carcinophilic *Careproctus* species of the Northern and Southern Hemisphere. (Auth.)

B-43837

Balushkin, A.V., **Review of blue notothenias of the genus *Paranotothenia* Balushkin (Nototheniidae) with description of a new species, *Journal of ichthyology*, 1990 30(6), p.132-147, Translated from Voprosy ikhtiologii. Refs. p.145-147.**

The genus *Paranotothenia* comprises two species: *P. magellanica* (Forster) and *P. dewitti* sp. n. The new species differs in coloration and body proportions, structure of the scales and other characteristics, as well as in mode of life (pelagic form) and geographical distribution, replacing the subantarctic *P. magellanica* in the higher latitudes of the Antarctic. Questions of evolution and dispersal of the blue notothenias are discussed. (Auth.)

B-43838

Makarov, R.R., Men'shenina, L.L., Timonin, V.P., Shurunov, N.A., **Ecology of larvae and reproduction of Euphausiidae in the Ross Sea, *Marine biology*, May-June 1990 16(3), p.156-162, Translated from Biologiya moria. 20 refs.**

In Feb.-Mar. 1981-1984, the larvae of *Euphausia superba* were encountered in the Ross Sea above the continental slope and in the ocean, and the larvae of *E. crystallorophias* occurred in the inner shallows of the sea. Their areas of distribution were separated by the frontal (secondary) zone between shelf waters and water cycle of the Ross Sea. The larvae of *E. superba* were always younger than those of *E. crystallorophias*. In Mar., furcilia II predominated among larvae of the latter species. The significance of the Ross Sea polynya as a factor determining the earlier start of spawning in *E. crystallorophias* than in *E. superba* is discussed. A fairly isolated local population of *E. crystallorophias* is noted, whose main distribution area apparently is the quasi-stationary cyclonic cycle in the south-western part of the sea. (Auth.)

B-43842

Davey, M.C., Davidson, H.P.B., Richard, K.J., Wynn-Williams, D.D., **Attachment and growth of antarctic soil cyanobacteria and algae on natural and artificial substrata, *Soil biology and biochemistry*, 1991 23(2), p.185-191, 19 refs.**

The attachment to artificial substrata (carborundum paper) of cyanobacteria and algae isolated from antarctic fellfield soils was investigated using a simulated flow apparatus. Generally, the rugosity of the substratum was less important than the morphology and extent of mucilage production of the microflora in determining attachment success. However, the smoothest grades of substratum did increase the retention of the fine filaments of the cyanobacterium *Pseudanabaena* and decreased the retention of the large filaments of the chlorophyte *Zygnema*. Filaments of the motile cyanobacterium *Phormidium* and cells of the motile diatom *Pinnularia* showed good retention on all grades of paper, with that of *Phormidium* being the highest of all taxa at 90-100%. The coccoid chlorophyte *Planktosphaerella* was

poorly retained on all grades of substratum. Growth rates of the same organisms on fellfield soils were little affected by soil rugosity, although the largest soil particles (1-2 mm) did cause a decrease in the growth rate of *Phormidium* and increase in that of *Planktosphaerella*. These results indicate the importance of the cyanobacterial-algal flora, and especially the motile component, in the stabilization of fellfield soils. (Auth.)

B-43844

Boyd, I.L., **Changes in plasma progesterone and prolactin concentrations during the annual cycle and the role of prolactin in the maintenance of lactation and luteal development in the antarctic fur seal (*Arctocephalus gazella*)**, *Journal of reproduction and fertility*, Mar. 1991 91(2), p.637-647, 38 refs.

Progesterone in fur seals was undetectable from 1-2 days before parturition to 4-6 days after parturition. There was a rapid increase in progesterone to 20 ng/ml between 6 and 10 days *post partum*, and this increase coincided with peak concentrations of oestradiol-17 beta. Newly formed corpora lutea were present in the ovaries by Day 9 *post partum*. Thereafter, progesterone remained detectable, but at a low concentration (5 ng/ml) throughout embryonic diapause. Plasma prolactin, measured against a human prolactin standard, was elevated from 1-2 days before parturition and peaked at 0-3 days *post partum*. It then declined slowly throughout the post-partum period and remained at a low level throughout embryonic diapause. Prolactin concentration declined to undetectable at the end of diapause and before the end of lactation. Reduction of prolactin secretion by injections of bromocriptine from Days 3 to 5 *post-partum* terminated lactation. This study has shown that prolactin is an important hormone for maintaining early lactation in the fur seal and it probably also has a role in the control of ovulation and luteal development. Prolactin does not appear to be implicated in the control of lactation cycles in fur seals. Changes in plasma progesterone during the annual cycle show that the pattern in fur seals resembles that of some carnivores with embryonic diapause. (Auth. mod.)

B-43845

Bengtson, J.L., **Antibodies to canine distemper virus in antarctic seals**, *Marine mammal science*, Jan. 1991 7(1), p.85-87, 8 refs.

Tests on recently collected blood samples from seals near the Antarctic Peninsula indicated the presence of antibodies to canine distemper virus (CDV) in crabeater seals (*Lobodon carcinophagus*) and leopard seals (*Hydrurga leptonyx*). CDV (a morbillivirus in the family Paramyxoviridae) or a related virus is suspected to have been the primary cause of a widespread epizootic among Baikal seals (*Phoca sibirica*) in 1987. This infective agent is distinct from the virus causing the disease in European harbor seals (*Phoca vitulina*) in 1988-1989. Furthermore, antibodies against CDV were reported in harp seals (*Pagophilus groenlandicus*) from Greenland. No samples from Weddell seals were seropositive to the CDV or PDV strains, confirming results of previous investigations.

B-43847

Zielinski, K., **Bottom macroalgae of the Admiralty Bay (King George Island, South Shetlands, Antarctica)**, *Polish polar research*, 1990 11(1-2), p.95-131, Refs. p.128-130.

In Admiralty Bay, 36 taxa of macroalgae were found; the most common were: green alga *Monostroma hariotti*, red algae *Georgiella confluens*, *Iridaea cordata*, *Leptosarca simplex* and *Plocamium cartilagineum*, and brown algae *Adenocystis utricularis*, *Ascoseira mirabilis*, *Desmarestia anceps*, *D. ligulata*, *D. menziesii* and *Himantothallus grandifolius*. Three zones of phytobenthos vertical distribution were determined. Zone 1 includes the macroalgae of the epilittoral, littoral and the sublittoral, to a depth of 10 m. Zones 2 and 3

are situated in the sublittoral, within depths of 10-90 m. Each zone is characterized by the occurrence of different aggregations of taxa. The bottom area of zones 1, 2 and 3 is covered by macroalgae to the extent of 28%, 64% and 8%, respectively, in relation to the total surface of phytobenthos in the Bay. (Auth. mod.)

B-43848

Ochyra, R., **Discovery of the South Georgian endemic species *Schistidium urnulaceum* (C. Muell.) B.G. Bell (Musci: Grimmiaceae) in the Antarctic**, *Polish polar research*, 1990 11(1-2), p.133-146, Refs. p.143-145.

Schistidium urnulaceum (C. Muell.) B.G. Bell, a species hitherto known from the subantarctic island of South Georgia, is reported for the first time from King George I., in the antarctic botanical zone. A description of the species, together with illustrations, notes on habitat and a distribution map are provided. Taxonomic notes to assist in the identification of *S. urnulaceum* are also given. (Auth.)

B-43849

Klokov, V., Kaup, E., Zierath, R., Haendel, D., **Lakes of the Bunger Hills (East Antarctica): chemical and ecological properties**, *Polish polar research*, 1990 11(1-2), p.147-159, 16 refs.

The results of chemical and biological analyses of lake water samples, taken in the Bunger Hills during Jan.-Mar. 1987 by participants of the 32nd Soviet Antarctic Expedition from the new seasonal station Oasis-2, are presented. It was discovered that the sea contributed considerably to the formation of intraoasis isolated reservoirs. The water of the epishelf lake, Transkripcii Bay, consists of two layers: upper freshwater (0.3-1.0 per mill) and lower salt water (19 per mill); the bottom water contains H₂S. The phosphate concentration varied from 3-8 mg/l in freshwater lakes to 37 mg/l in Pass Cove, where a high concentration of chlorophyll *a* (up to 10 mg/l) was found. (Auth.)

B-43850

Filcek, K., Zielinski, K., **Report on the expedition of Polish biologists to Bunger Hills, East Antarctica, 1988/89**, *Polish polar research*, 1990 11(1-2), p.161-167, 5 refs.

A summer expedition to Bunger Hills in 1988-1989 is reported. The purpose of the voyage was to carry out extensive ecological surveys and to consider possibilities for future biological investigation in the area. Regional geomorphology, limnology, ecology and climate are reviewed.

B-43869

Zernova, V.V., **Species composition of the phytoplankton in the southern ocean** [Vidovaia struktura fitotsena Iuzhnogo okeana], *Antarktika; doklady komissii*, 1990 No.29, p.128-146, In Russian with English summary. 19 refs.

Quantitative data of the planktonic algae of the southern ocean allows one to establish the level of productivity of the total phytoplankton as well as that of the different groups and species. The successive movement of the cells maximum to the South in spring and to the North in autumn was shown. In the Subantarctic spring, the total quantity of phytoplankton very soon reaches its maximum, but in the beginning of summer, the quantity of cells rapidly decreases. In antarctic waters in Jan.-Mar. the quantity of cells varies. In autumn, when the floating ice advances and winter convection in the North increases, the area of vegetation of cells gradually decreases and moves to the North together with the boundary of floating ice. The obtained data allow one to determine the level of quantitative development of several typical species as well as to demonstrate seasonal succession of these species. (Auth. mod.)

B-43870

Timonin, V.P., Zhigalov, I.A., **Peculiarities of the age composition, distribution and drift of *Euphausia superba* larvae in the Somov Sea and adjacent waters** [Osobennosti vozrastnogo sostava, raspredeleniia i dreĭfa lichinok *Euphausia superba* v more Somova i prilezhashchikh vodakh], *Antarktika; doklady komissii*, 1990 No.29, p.147-159, In Russian with English summary. 22 refs.

The distribution of age groups of *Euphausia superba* larvae during 1976-1986 investigations, along with the analysis of currents in the Somov Sea, mainly in the region of Balleny Is., was considered. The calyptopis I and II were abundant (up to 13,000 spc. 0.1/sq m) in late Feb.-Mar. The main reason for formation of this local larvae concentration is the presence of the closed local gyres, significant heterogeneity of dynamic relief and the absence of long directed water shift. The redistribution of the larvae abundance in the ranges of this region is under the influence of synoptic variations of dynamic conditions. (Auth.)

B-43871

Trotsenko, B.G., Gerasimchuk, V.V., Korshunova, G.P., **Peculiarities in the distribution of antarctic silverfish *Pleuragramma antarcticum* (Nototheniidae) and spiny icefish *Chaenodraco wilsoni* (Channichthyidae) in connection with spatial structure of antarctic seas** [Osobennosti raspredeleniia antarkticheskoi serebrianki *Pleuragramma antarcticum* (Nototheniidae) i ledianoĭ ryby Vil'sona *Chaenodraco wilsoni* (Channichthyidae) v zavisimosti ot prostranstvennoi struktury vod primaterikovykh moreĭ Antarktidiy], *Antarktika; doklady komissii*, 1990 No.29, p.159-172, In Russian with English summary. Refs. p.171-172.

The results of oceanographic surveys and of simultaneously conducted biological investigations in the Cosmonauts and Commonwealth Seas are analyzed. The prevalence of antarctic silverfish was found in the western and eastern areas of the Cosmonauts Sea and in the western part of the Commonwealth Sea. Spiny icefish prevailed in the central area of Cosmonauts Sea only. Food competition between these two species is not significant and cannot be seen as a cause of dominance. The structures of aggregations and behavior of fishes seem to be determined by spatial peculiarities of the hydrostructure of a habitat. A degree of spatial homogeneity of hydrostructure and a stage of vertical stability field are the leading factors. The spiny icefish tends to homogeneity of a larger scale, while antarctic silverfish tends to that of a smaller scale. The existence of two types of biotopes, antarctic silverfish and spiny icefish, is suggested. (Auth.)

B-43872

Abyzov, S.S., Kirillova, N.F., Cherkesova, G.V., **Presence of spore-forming bacteria in the ice sheet of Central Antarctica** [Rasprostranenie sporoobrazuiushchikh bakterii v tolshche lednika Tsentral'noi Antarktidiy], *Antarktika; doklady komissii*, 1990 No.29, p.172-184, In Russian with English summary. Refs. p.182-184.

Small amounts of spore forming bacteria, found in samples of antarctic air, snow, ice and soil, are discussed. Low moisture and frequent temperature variations are considered to be the main limiting factors for the development of these microorganisms. Some authors consider that the presence of most spore-forming bacteria is caused by numerous field expeditions to Antarctica. However, the analysis of ice core samples taken aseptically in the region of Central Antarctica showed that many of the spore-forming bacteria species thought to be introduced by man had been brought by air streams much earlier. Some physiological characteristics of antarctic spore-forming bacteria were compared with those of analogous species from culture collections. It is concluded that the bacteria, weakened by the long storage

of about 12,500 years in anabiotic state, are able to come back to life and reproduce. (Auth. mod.)

B-43876

Buchholz, F., **Moult cycle and growth of antarctic krill *Euphausia superba* in the laboratory**, *Marine ecology progress series*, Jan. 24, 1991 69(3), p.217-229, Refs. p.228-229.

Using systems for long-term maintenance of the krill *Euphausia superba* in aquaria, positive growth was measured in a large number of specimens under controlled conditions. The first moult always showed the greatest growth increment. The high laboratory growth rates agreed with previous field investigations. Often-reported 'abnormal' slow and predominantly negative growth was probably due to inadequate maintenance procedures. Moulting was partly synchronous, and moult frequency was temperature dependent. Growth of krill did not match the slow rates expected of a polar species. Krill was very sensitive to experimental variation in feeding regime: moult frequency (14-29 d) and growth increment at moult (-15 to 21%) varied together. Ecdysis and the staging and timing of the moult cycle were studied. (Auth. mod.)

B-43877

Barthel, D., Gutt, J., Tendal, O.S., **New information on the biology of antarctic deep-water sponges derived from underwater photography**, *Marine ecology progress series*, Jan. 24, 1991 69(3), p.303-307, 17 refs.

Aspects of the biology of sponges from deeper parts of the Weddell Sea, documented by underwater photography, are described and compared to material from bottom trawling. The photographs provide new, important information on the biology and ecology of antarctic sponges, such as positioning on the sea bottom, live body form and dimensions, as well as on the degree of body surface fouling. Such information is not obtainable from trawled material. (Auth.)

B-43883

Zhivov, V.V., Krivoruchko, V.M., **On the biology of the Patagonian toothfish, *Dissostichus eleginoides*, of the antarctic part of the Atlantic**, *Journal of ichthyology*, 1990 (Pub. Apr. 91) 30(7), p.142-146, Translated from Voprosy ikhtiologii. 18 refs.

The Patagonian toothfish belongs to the group of near-bottom pelagic species of fish not found in open water, in spite of intensive trawling surveys conducted in the antarctic pelagic zone. Commercial exploitation of fish resources of the southern ocean has shown that, in bottom trawl catches on the island-shelf area of the antarctic part of the Atlantic, Patagonian toothfish are taken quite frequently, principally young and sexually immature fish, 21-152 cm long (mode 40-60 cm). The data from trawl catches do not, however, reflect a true picture of the distribution of this species. Experimental catches of toothfish in the bottom layer of the Shag Rocks, and on the shelf of the island of South Georgia, have significantly added to the information about this species which is presented in this article. (Auth. mod.)

B-43885

Medlin, L.K., ed, Priddle, J., ed, **Polar marine diatoms**, Cambridge, UK, British Antarctic Survey, Natural Environment Research Council, 1990, 214p., Refs. p.199-214.

This book provides an account of diatoms in polar marine habitats, principally in the plankton and sea-ice communities. It has been designed as a practical sourcebook for marine biologists who are working with diatoms in polar seas. An international group of seventeen authors has contributed 9 chapters on ecology, 15 chapters on taxonomy and a bibliography. Both antarctic and arctic habitats and species

are covered. The Ecology section contains environmental descriptions and brief overviews of diatom communities. Additional attention is paid to methods and to the significance of diatoms in the fossil records in polar oceans. The Taxonomy section is prefaced by a key to families and a simple glossary. Following these, chapters treat families or single genera, concentrating on key diagnostic features visible in the light microscope. Detailed systematic discussion is avoided, but the authors have tried to use the latest nomenclature. The Bibliography not only indexes the references cited in the text, but also provides additional titles of relevance to polar marine diatom studies. (Auth.)

B-43887

Horner, R., **Ice-associated ecosystems**, Polar marine diatoms, edited by L.K. Medlin and J. Priddle, Cambridge, UK, British Antarctic Survey, Natural Environment Research Council, 1990, p.9-14.

Sea ice is present for all or varying portions of the year at high latitudes in both hemispheres. Physically, sea ice reduces solar input and wind mixing in the upper layers of the water column. These, along with periodic freezing and thawing of the ice, affect the temperature and salinity structure of the underlying seawater. Biologically, sea ice provides a unique environment that is used by a wide variety of organisms, from bacteria to marine mammals. The best known of the ice-associated assemblages is that of the ice algae, although information on assemblages of ice fauna and bacteria is gradually accumulating. (Auth.)

B-43889

Priddle, J., **Antarctic planktonic ecosystem**, Polar marine diatoms, edited by L.K. Medlin and J. Priddle, Cambridge, UK, British Antarctic Survey, Natural Environment Research Council, 1990, p.25-34.

The trophic structure of the southern ocean pelagic environment has often been represented as being comparatively simple, with the food-chain 'diatom-krill-baleen whale' representing the dominant path for energy transfer. On the one hand, this obviously neglects the complex interactions between other components, including the large number of other animal species which compete with or depend on the antarctic krill (*Euphausia superba*). On the other hand, the very simple food-chain does symbolize some important properties of the trophic structure of the southern ocean pelagic ecosystem. In particular, it shows that energy flow may follow a relatively short path in which transfers occur between organisms dramatically different in size. The key role of antarctic krill in the pelagic ecosystem has been demonstrated by the effects of the decline of baleen whales as a result of the whaling industry. This anthropogenic perturbation of the ecosystem is thought to have left a significant krill surplus no longer consumed by the whales. This surplus has been taken up by increases in the biomass of several other species of krill predators. (Auth. mod.)

B-43906

Roots, O.O., Kamenev, V.M., Kaup, E.B., **Polychlorinated biphenyls in antarctic ecosystems** [Polikhlorirovannye bifenily v ekosistemakh Antarktiki], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.95-101, In Russian. 15 refs.

Tests on PCB and DDT concentrations, conducted on living organisms around Mirnyy Station in Jan. 1980, and in the vicinity of Lake Unter-See in Dec. 1983, are discussed, and studies on PCB and DDT contents in tissues of antarctic krill, fish and seals, in air, snow and water, are reviewed. It is concluded that, although considerable pollution was found, when compared to other regions on Earth antarctic pollution is negligible.

B-43907

Bulavintsev, V.I., **Microarthropods of Fildes Peninsula and Ardley and Nelson Islands in the complex ecological monitoring of the Antarctic** [Kompleksy mikroartropod poluostrovov Faïlds, Ardli i ostrova Nel'son v sisteme kompleksnogo ekologicheskogo monitoringa Antarktiki], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.101-108, In Russian. 4 refs.

Discussed, and presented in tables, are results of studies conducted in the summer of 1986-1987 on the species composition and population of microarthropods at different ground levels and in specific substrata of the Bellingshausen Station region. Sixteen species of Collembola and soil mites are identified. Great numbers and variety of microarthropod populations are observed on high terraces and the undulating plateau. A large population of soil organisms are found in the zoogenic substrata in nesting areas of penguins, sea gulls and petrels. The populations and variety of species decrease on lower terraces, beaches and glacial moraines.

B-43908

Vekhov, N.V., **Branchinecta gaini (Branchiopoda, Anostraca) from antarctic and subantarctic lakes** [Branchinecta gaini (Branchiopoda, Anostraca) iz vodoemov Antarktiki i Subantarktiki], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.108-114, In Russian. 16 refs.

Species composition, distribution, physiology, morphological differences between species and sexes, and life cycle of *Branchinecta gaini* were studied in 83 tests conducted on specimens from 53 freshwater lakes—on King George, Nelson and South Georgia Islands—during Nov. 1986 to Mar. 1987. The active phase of the life cycle of this species lasts no more than 6 months. During that time one generation of *Branchinecta* develops. The reproductive season lasts from Jan. to the middle or end of May.

B-43915

Sugawara, H., Tanno, K., Ohyama, Y., Fukuda, H., **Freezing-tolerance of *Macrobiotus harmsworthi* (Tardigrada) and *Plectus antarcticus* (Nematoda) in the antarctic region**, *Antarctic record*, Nov. 1990 34(3), p.292-302, In Japanese with English summary. 21 refs.

In Jan. 1988, mosses were collected in the ice-free area near Showa Station, and were stored at -20 C and shipped to Japan. After ten months of storage, *Macrobiotus harmsworthi* J. Murray (Tardigrada) and *Plectus antarcticus* De Man (Nematoda) were extracted from the mosses to test their freezing tolerance. Most individuals of *M. harmsworthi* were dormant at low temperatures. The activity ratio (RA) of individuals cooled to temperatures below -32 C ranged from 80 to 100% two hours after thawing. The values remained as high as 75-86% even after five weeks. The individuals cooled to -10 C or -18 C showed a smaller RA (70% two hours later and only about 50% five weeks later.) In *P. antarcticus* the RA values of four hours after thawing ranged from 46% (-32 C) to 100% (-10 C). Unlike *M. harmsworthi*, most of them quickly died during the incubation at 0 C; RA of two weeks after thawing was 0% in the individuals cooled to -10 C or -18 C and 3-11% in the individuals cooled to -32 C or below. In five weeks after thawing, all of them had died. Overall, *M. harmsworthi* and *P. antarcticus* were freezing tolerant; moreover, they seemed more tolerant when cooled to lower temperatures. (Auth. mod.)

B-43924

David, B., Mooi, R., **Echinoid that "gives birth": morphology and systematics of a new antarctic species, *Urechinus mortenseni* (Echinodermata, Holasteroidea)**, *Zoomorphology*, 1990 110(2), p.75-89, 27 refs.

A new species of urechinid holasteroid, *Urechinus mortenseni*, is described in which juveniles are brooded inside a deeply invaginated extension of the body wall suspended from the interior edges of the female's apical plates. This is the first complete description of brooding in the Holasteroidea. The morphology of the brooding system is described, and a new terminology is erected to refer to the completely novel features of the system: the apical aperture, birth canal, and brood pouches. The plating, spines, and pedicellariae of the brooding system are also described. The salient characteristics of the brooding system found in *U. mortenseni* are contrasted with those of brooding strategies in other echinoderms. The new species is compared with other holasteroids. For the first time, a brooding system is also described in *Plexechinus nordenskjoldi*, which implies that it is closely related to *U. mortenseni*. This casts doubt on the integrity of the two genera, and suggests that a phylogenetic revision is required to highlight the unique features found not only in these unusual urechinids, but in other holasteroids as well. (Auth. mod.)

B-43925

Chaigneau, J., **Organ of Bellonci of an antarctic crustacean, the marine isopod *Glyptonotus antarcticus***, *Journal of morphology*, Feb. 1991 207(2), p.119-128, 35 refs.

The paired organ of Bellonci protrudes from the optic lobe of the giant isopod, *Glyptonotus antarcticus*. It is linked to the cortex by a broad peduncle. No connection to the cuticle or "sensory pore organ" was found. A cluster of sensory-like cells forms two outer ciliary segments branching into numerous microvilli with microtubules. The putative sensory somata are irregular in shape and contain a very high density of glycogen granules. The two outer segments sprout from two pits of the soma in different directions, forming a right angle. Glial cells wrap around the sensory cells and also delimit lacunae into which bundles of microvilli project. These lacunae contain electron-dense granules of small size and with species-specific patterns. Lacunae and dense granules show features typical of a degeneration process in the sensory cells. This general morphology corresponds to the unilobular type of organ of Bellonci, known in other isopods; it differs from the plurilobular type with onion bodies found in other Crustacea. (Auth.)

B-43926

Archer, S.D., Johnston, I.A., **Density of cristae and distribution of mitochondria in the slow muscle fibers of antarctic fish**, *Physiological zoology*, Jan./Feb. 1991 64(1), p.242-258, Refs. p.256-258.

Muscle capillary supply, mitochondrial distribution, and the surface density of mitochondrial cristae have been determined in the pectoral fin adductor profundus muscles of fish that use a labriform mode of locomotion. Species studied were the hemoglobinless antarctic icefishes *Chaenocephalus aceratus* and *Champscephalus gunnari*, the red-blooded antarctic fishes *Notothenia gibberifrons* and *Psilodraco breviceps*, and the Northern Hemisphere temperate-water fish *Callionymus lyra*. The volume density of mitochondria in slow-twitch fibers decreased in the order *C. gunnari* (0.51) > *C. aceratus* (0.49) > *P. breviceps* (0.46) > *N. gibberifrons* (0.25). Surface densities of mitochondrial cristae were lower in *C. gunnari* and *C. aceratus* than in the red-blooded species. This is consistent with the observation that oxygen consumption per unit volume of mitochondria is lower in the hemoglobinless species. The density of mitochondria adjacent to capillaries is not significantly different from that in the central core of fibers in *C. aceratus*. This suggests that slow muscle fibers are not diffusion limited for oxygen in species lacking hemoglobin and myoglobin. The high and homogenous distribution of mitochondria in antarctic fish results in low values for the mean free spacing of mitochondria (1.04-2.96 microns) relative to temperate species. This may represent an adaptation to overcome the effects of low temperature on the diffusion of metabolites between capillaries

and mitochondria and between mitochondria and myofibrils. (Auth.)

B-43927

Boyd, I.L., Duck, C.D., **Mass changes and metabolism in territorial male antarctic fur seals (*Arctocephalus gazella*)**, *Physiological zoology*, Jan./Feb. 1991 64(1), p.375-392, Refs. p.390-392.

Energy expenditure of fasting territorial male fur seals at South Georgia was measured by mass loss and analysis of carcass composition using tritium dilution in 1987 and 1988. Mean mass loss was 1.5 kg/d, mean length of territory tenure was 30.7 d, mean mass at the start of tenure was 188.0 kg; there were no differences between the two years ($P > 0.1$). Mass loss was 53.8% fat (80% of which was from blubber), 36% water, and 10.2% protein. Fat accounted for 91.6% of energy expenditure, the remainder being from protein. Energy expenditure was 42.1 MJ/d, or 3.16 W/kg, which is 3.3 times the predicted basal metabolic rate. Large body size in male compared to female fur seals may be related to the energy requirements of territoriality, but only in 1988 was there a significant correlation between starting mass and duration of tenure. This suggests that energy reserves are only one of several factors influencing tenure duration. Male fur seals are composed of 24% fat when they arrive at the breeding grounds, which is lower than for most other pinnipeds that fast through an extended period ashore. (Auth.)

B-43928

Bost, C.A., Jouventin, P., **Relationship between fledging weight and food availability in seabird populations: is the gentoo penguin a good model**, *Oikos*, Feb. 1991 60(1), p.113-114, 10 refs.

In the Kerguelen Is., where direct estimations of seashelf productivity were available from fisheries, breeding performance of gentoo penguins was monitored over 3 years. It was found that only 0.5% of pairs reared successfully two chicks. In "poor" years (e.g. 1989) chicks were 12% lighter at fledging, stomach contents were 30% lighter than during a "good" year as 1987, and foraging trips 60% longer. During this year, catches by fishing vessels of demersal (*Nototheniidae* sp.) and semi-pelagic fishes (*Channychtydae* sp.) which are caught as juveniles by gentoo penguins were abnormally low. At Crozet Is., it was found that during some "good" years, as 1984, the post-fledging survival was not positively correlated with the weight at fledging.

B-43931

Rivkin, R.B., **Seasonal patterns of plankton production in McMurdo Sound, Antarctica**, *American zoologist*, 1991 31(1), p.5-16, Refs. p.14-16.

The prolonged periods of continuous darkness and light in polar regions have resulted in a unique seasonal partitioning of primary and heterotrophic production. In McMurdo Sound, for example, the biomass, size distribution and production by phytoplankton and bacterioplankton undergo distinct seasonal cycles. The seasonal pattern of primary production appeared to be regulated by light whereas the three order of magnitude change in phytoplankton biomass during mid- to late Dec. was largely controlled by the advection of planktonic algae from the Ross Sea into McMurdo Sound. The size distribution of phytoplankton was highly seasonal; nano- and picoplankton were dominant from Aug. through Nov. while netplankton were more abundant in Dec. and Jan. Seasonal variations of bacterial biomass and production were smaller than those of phytoplankton. During the late austral winter and spring, bacterial biomass and production exceeded those of phytoplankton. The facts that bacteria were both abundant and highly active, bacterivory was common among many of the endemic protozoa and some planktonic metazoa, and these bacterivores consumed >95% of the bacterial production, strongly suggest that bacteria are a crucial component in the transfer of energy and material to metazoans in polar regions. (Auth. mod.)

B-43932

Garrison, D.L., **Antarctic sea ice biota**, *American zoologist*, 1991 31(1), p.17-33, Refs. p.30-33.

The sea ice surrounding Antarctica provides an extensive habitat for organisms ranging in size from bacteria to marine birds and mammals. Over 200 species have been reported living on, in, or in association with antarctic sea ice. The ice biota includes bacteria, a variety of algae, heterotrophic protozoans and small metazoans. The diatom assemblages are the only taxonomic group that is known well enough to make comparisons among the various habitats. Studies by a number of workers suggest some specific diatom assemblages along with occurrence of species that are widely distributed in both ice and plankton. Ice may also serve as a temporary habitat for species that also comprise planktonic communities, so that providing a "seed population" for ice edge plankton blooms may be an important role of the ice biota. Trophic interactions among organisms in ice suggest that the ice assemblage is a true community with a well-developed microbial food web. The ice microbial community may be an important part of the antarctic marine food web because large consumers from the adjacent planktonic and benthic communities appear to feed on the ice biota. (Auth.)

B-43933

Miller, K.A., Pearse, J.S., **Ecological studies of seaweeds in McMurdo Sound, Antarctica**, *American zoologist*, 1991 31(1), p.35-48, Refs. p.47-48.

Three species of benthic marine macroalgae comprise the chief components of the seaweed flora of McMurdo Sound. Quantitative studies at Cape Evans demonstrate a depth-related distribution pattern, with *Iridaea cordata* (Turner) Bory in shallow water, *Phyllophora antarctica* A. and E.S. Gepp abundant and fertile at intermediate depths, and *Leptophytum coulmanicum* (Foslie) Adey dominant below 20 m. The vertical distribution of species is correlated with irradiance levels. At sites with thinner annual sea ice and less snow accumulation (e.g., Cape Evans, Cape Royds, and Granite Harbor), vertical distributions are shifted downward relative to those at sites that remain covered most of the year with thick or snow-covered fast ice (e.g., Cape Armitage and New Harbor). Disturbance caused by ice scour and anchor ice probably determines the upper limit of algal distribution; herbivory is apparently absent. There is a disproportionate representation of cystocarpic female gametophytes in populations of *I. cordata* and *P. antarctica*. Perennation via persistent basal crusts and apogamic recycling of gametophytes are suggested as factors structuring phase distribution. (Auth. mod.)

B-43934

Quetin, L.B., Ross, R.M., **Behavioral and physiological characteristics of the antarctic krill, *Euphausia superba***, *American zoologist*, 1991 31(1), p.49-63, Refs. p.61-63.

The relative importance is evaluated of four major winter-over mechanisms that have been proposed for adult krill west of the Antarctic Peninsula. The three-fold reduction in metabolic rate is the most important winter-over mechanism for these adults, although lipid utilization and shrinkage also help satisfy energy requirements in the winter. Alternate food sources did not appear to contribute significantly as a winter energy source. However, the extent, predictability and complexity of the ice cover in a region during winter may have a great influence on the relative importance of these winter-over mechanisms for different populations. Ice cover in the waters west of the Antarctic Peninsula is unpredictable and smooth surfaced when it occurs, providing the krill with little refuge from predation. In multi-year pack ice of the Weddell Sea, however, ice cover is predictable and extensive, and there is a complex undersurface that provides hiding places. In this multi-year ice, adult krill have been observed under the ice feeding, whereas west of the Antarctic Peninsula most adult krill are in the water column in the winter and are not feeding. The balance between acquiring energy and avoiding predation may be

different in these two regions in the winter because of differences in predictability and complexity of the ice cover. (Auth. mod.)

B-43935

Pearse, J.S., McClintock, J.B., Bosch, I., **Reproduction of antarctic benthic marine invertebrates: tempos, modes, and timing**, *American zoologist*, 1991 31(1), p.65-80, Refs. p.77-80.

Work on the life histories of common antarctic benthic marine invertebrates over the past several decades demands a revision of several widely held paradigms. First, contrary to expectations derived from work on temperate species, there is little or no evidence for temperature adaptation with respect to reproduction (gametogenesis), development, and growth. Secondly, contrary to the widely accepted opinion designated as "Thorson's rules," pelagic development is common in many groups of shallow-water marine invertebrates. In fact in some groups, such as asteroids, pelagic development is as prevalent in McMurdo Sound, the southernmost open-water marine environment in the world, as in central California. Thirdly, pelagic lecithotrophic development, often considered to be of negligible importance, occurs in many shallow-water antarctic marine macroinvertebrates. Some of the most abundant and widespread antarctic marine invertebrates have pelagic planktotrophic larvae that take very long times to complete development to metamorphosis. Although planktotrophic larvae tend to be seasonal in occurrence, their production is not linked particularly closely to the mid-summer pulse of phytoplankton production. These larvae show no evidence of starvation, even during times when phytoplankton abundance is very low, and they may depend on unusual sources of food, such as bacteria. (Auth. mod.)

B-43936

Clarke, A., **What is cold adaptation and how should we measure it**, *American zoologist*, 1991 31(1), p.81-92, Refs. p.91-92.

Cold adaptation encompasses all those aspects of an organism's physiology that allow it to live in polar regions. With the exception of the special case of the need to avoid freezing, it is therefore merely a specific example of the more general temperature compensation needed by all marine organisms. Temperature compensation is a form of homeostasis; the extent to which a given organism has achieved this can only be assessed in those processes which can be studied at the molecular level. Recent studies of antarctic organisms, primarily fish, have indicated that compensation is not always perfect. Studies of complex integrated processes such as growth or respiration do not necessarily give useful information concerning cold adaptation. (Auth. mod.)

B-43937

Eastman, J.T., **Evolution and diversification of antarctic notothenioid fishes**, *American zoologist*, 1991 31(1), p.93-109, Refs. p.106-109.

Antarctica supported fossil ichthyofaunas during the Devonian, Jurassic, Cretaceous and Eocene/Oligocene. These faunas are not ancestral to each other, nor are they related to any component of the modern fauna. About 100 species of notothenioids dominate a modern fauna of over 200 species of bottom fishes. This highly endemic perciform suborder is not represented in the fossil record of Antarctica. Notothenioids may have evolved *in situ* on the margins of the antarctic continent while gradually adapting to cooling conditions during the Tertiary. Cladistic studies indicate that notothenioids are a monophyletic group, but a sister group has not been identified among perciform fishes. With relatively few non-notothenioid fishes in antarctic waters, notothenioids fill ecological roles normally occupied by taxonomically diverse fishes in temperate waters. There are six notothenioid families. Aspects of their biology are briefly considered with emphasis on the Nototheniidae, the most speciose family. Evolutionary diversification within this family allows recog-

dition of species which are pelagic, cryopelagic, benthopelagic and benthic. (Auth. mod.)

B-43938

Costa, D.P., **Reproductive and foraging energetics of high latitude penguins, albatrosses and pinnipeds: implications for life history patterns**, *American zoologist*, 1991 31(1), p.111-130, Refs. p.127-130.

Pinnipeds and seabirds feed at sea, but are tied to shore to rear their young. Such a fundamental constraint should lead to convergent adaptations in foraging and reproductive ecology. However, intrinsic differences in mammalian and avian reproductive biology may limit the potential for convergence. In this paper, both reproductive and foraging energetics of pinnipeds and seabirds are examined. This is done to identify traits that might be considered convergent adaptations to life in the marine environment, and to show how divergent life history patterns are optimal for different reasons. From this analysis it was found that seabirds invest a greater total amount of energy and protein into the offspring than pinnipeds, but this comes at the cost of making more trips to sea. Pinnipeds forage in a manner more consistent with the predictions of central place foraging theory and exhibit a greater ability to adapt to the shortened breeding season typical of antarctic environments. (Auth. mod.)

B-43939

Hunt, G.L., Jr., **Marine ecology of seabirds in polar oceans**, *American zoologist*, 1991 31(1), p.131-142, Refs. p.139-142.

Patterns of seabird species' distributions differ between the Antarctic and the Arctic. In the Antarctic, distributions are annular or latitudinal, with strong similarities in species composition of seabird communities in all ocean basins at a given latitude. Differences between the seabird communities in the Northern Hemisphere and the Southern Hemisphere reflect differences in the patterns of flow of major ocean current systems. The distribution of avian biomass is affected by both physical and biological features of the ocean. In the Antarctic, much seabird foraging is over deep water, and within-season, small-scale patchiness in prey abundance and availability in ice-free waters is likely to be controlled primarily by the behavior of the prey, rather than by physical features. Ice cover appears to be the most important physical feature in the Antarctic. An entire community of birds is specialized to use prey taken near the ice edge. These prey consist of a variety of species, some of which are normally found much deeper in the water than the birds taking them can dive. The open-water portion of the marginal ice zone is also an important foraging habitat for antarctic marine birds. Recent simultaneous surveys of birds and their prey indicate that only rarely does the small-scale abundance of birds match that of their prey; correlations between predators and prey are generally stronger at larger scales. Evidence is accumulating in the Antarctic that the largest aggregations of krill may be disproportionately important to foraging seabirds. (Auth. mod.)

B-43940

Siniff, D.B., **Overview of the ecology of antarctic seals**, *American zoologist*, 1991 31(1), p.143-149, 25 refs.

Four species of seals occupy the pack-ice region of the oceans surrounding the Antarctic Continent: the crabeater (*Lobodon carcinophagus*), leopard (*Hydrurga leptonyx*), weddell (*Leptonychotes weddellii*), and ross (*Ommatophoca rossii*), and are true seals with special adaptations for living in the pack-ice region. Two other seal species, the southern elephant seal (*Mirounga leonina*) and the fur seal (*Arctocephalus gazella*) (the only eared seal of this region) generally occur further to the north and use land rather than ice during the period of birth of young. This paper reviews the status of these species, and examines the general ecology of the 4 species that inhabit the pack-ice zone. Also reviewed is the interaction between the leopard and the crabeater which occupy the same regions and eat krill (*Eu-*

phausia superba), particularly during the winter. The impact of the potential harvest of krill by man on these species is discussed. Further, the impact of the recovery of the large baleen whales that feed in this region during the summer is discussed with regard to the changes that might occur as competition for krill by the large vertebrate species increases. (Auth. mod.)

B-43945

Mortlock, R.A., **Evidence for lower productivity in the antarctic ocean during the last glaciation**, *Nature*, May 16, 1991 351(6323), p.220-223, 39 refs.

Both increased biological productivity and more efficient uptake of upwelled nutrients in high-latitude oceans have been proposed as mechanisms responsible for the glacial reduction in atmospheric concentrations of carbon dioxide deduced from ice-core measurements. These glacial models invoke more efficient 'biological pumping' of carbon into the deep sea by increasing the uptake of 'excess' biolimiting nutrients in the antarctic surface ocean, or by reorganizing chemical circulation patterns within the ocean. The authors challenge this conventional view with new evidence from tracers of palaeoproductivity preserved in antarctic sediments. Records of the accumulation rates of diatom shells, the ratio of germanium to silicon in diatomaceous opal, and the carbon isotope ratio in foraminiferal carbonate all suggest lower glacial productivity and less efficient uptake of nutrients. Although alternative interpretations are possible, the results support previous studies that indicate lower glacial productivity in the southern ocean, and raise new questions about the role of ocean productivity in models of the causes (or remedies) for changes in atmospheric concentrations of carbon dioxide. (Auth.)

B-43953

Greenfield, L.G., Wilson, K.J., **Adélie penguin colony estimations from aerial photography and ground counts**, *Polar record*, Apr. 1991 27(161), p.129-130, 7 refs.

The reliability of penguin counts obtained from aerial photographs is discussed. Ground counts of occupied nests, of which most are occupied by breeding birds, underestimate the total number of breeding pairs only by the numbers of failed breeders up to the time of the count. Accuracy using two observers, one of whom is experienced, is usually within $\pm 5\%$. Such a count can be made only during the early incubation period when most birds ashore are incubating, whilst mates and non-breeding birds are feeding at sea. For Adélie penguins *Pygoscelis adeliae* throughout the Ross Sea region, this occurs in late Nov. and early Dec. A comparison is discussed of counts made on the ground at Cape Bird with those from aerial photographs taken within a few days of the ground count. Total bird numbers derived from aerial photographs and ground counts were within 2% of each other.

B-43956

Priscu, J.C., Lizotte, M.P., Cota, G.F., Palmisano, A.C., Sullivan, C.W., **Comparison of the irradiance response of photosynthesis and nitrogen uptake by sea ice microalgae**, *Marine ecology progress series*, Feb. 28, 1991 70(2), p.201-210, Refs. p.209-210.

The response of photosynthesis, and of the uptake of NO_3^- , NH_4^+ and serine, to irradiance was measured in diatom-dominated sea ice microbial assemblages from bottom ice and surface ice of McMurdo Sound. According to model predictions, uptake rates in the bottom ice assemblage were always limited by irradiance; neither light saturation nor photoinhibition regulated photosynthesis or DIN utilization in this assemblage. Conversely, photosynthesis in the surface ice assemblage was nearly always light-saturated, whereas DIN uptake was photo-inhibited near midday and saturated at the minimum irradiance. Integrated daily C:DIN uptake ratios (g:g) in the bottom ice and surface assemblages were 8.6 and 9.7, respectively, corresponding to particulate C:N ratios (g:g) of 8.1 and 5.8 for these

respective diatom-dominated communities. Results indicate that information on diel patterns of photosynthesis and N uptake is required to evaluate accurately the stoichiometric balance of essential elements in sea ice microalgae. (Auth. mod.)

B-43957

Schnack-Schiel, S.B., Hagen, W., Mizdalski, E., **Seasonal comparison of *Calanoides acutus* and *Calanus propinquus* (Copepoda: Calanoida) in the southeastern Weddell Sea, Antarctica, *Marine ecology progress series*, Feb. 14, 1991 70(1), p.17-27, Refs. p.26-27.**

The copepods *Calanoides acutus* and *Calanus propinquus* were studied for seasonal differences in life cycles in the southeastern Weddell Sea in Jan.-Feb. 1985 and in Oct.-Nov. 1986. During late winter/early spring older stages of *C. acutus* were concentrated below 500 m. Males had reduced mouthparts and were only found in Oct.-/Nov. in deep waters where mating occurred. Females with semiripe and ripe gonads migrated to the surface in Nov. to spawn. Their ascent coincided with an increase in swimming and respiration activity. In summer the majority of *C. acutus* occurred above 200 m. *C. propinquus* also occurred in deeper waters in late winter/early spring, but above 500 m. Males had well-developed mouthparts and were found in small numbers throughout both investigated periods. No great changes in activity were observed from late winter to summer. The summer population was concentrated in the upper 100 m. As with *C. acutus*, there was a dramatic increase in abundance of *C. propinquus* from Jan. to Feb. The lipids of *C. propinquus* consisted mainly of triacylglycerol, a very unusual storage lipid class in polar calanoid copepods. *C. acutus* and *C. propinquus* seem to represent different life histories: the wax-ester-accumulating *C. acutus* overwinters in a resting stage in deeper waters while the stiacylglycerol-storing *C. propinquus* may feed and reproduce over a more extended period than *C. acutus*. (Auth. mod.)

B-43966

Bianchi, R.A., Palmada, M.N., Gutierrez, L., Maldonado, M.C., Piezzi, R.S., **Thyroid of the penguin *Pygoscelis papua*: comparative, structural and biochemical study [La tiroides del pingüino *Pygoscelis papua*: estudio comparativo, estructural y bioquímico], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.367, 20p., In Spanish with English, French and German summaries. 29 refs.**

The thyroid of the penguin *Pygoscelis papua* consists of two lobes, the right and the left, situated in the thoracic cavity. Histologically, follicles lined with a cubic epithelium, whose cells show structural characteristics described in other species, were observed. The openings of the follicles are filled with an amorphous and homogeneous material (colloid). The biochemical data show that the protein content, expressed by 100 mg of wet tissue, is similar to that observed in other homeotherm vertebrates. The thyronine content is markedly higher than that found in mammals, or even in other birds. This difference within the class is attributed partly to the fact that in the *Pygoscelis papua* a sex influence exists: the specific hormonal activity in the male is nearly double that of the female. The analysis of the thyroid iodine content confirms the abundance of this element in the feeding habitat of the antarctic penguin. (Auth. mod.)

B-43967

Barrera Oro, E.R., **Age determination in *Notothenia gibberifrons* from the South Shetland Is., subarea of the Antarctic Peninsula. (Subarea 48.1) [Determinación de la edad en *Notothenia gibberifrons* de las islas Shetland de Sur, subárea de la península Antártica. (Subárea 48.1)], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1990 No.373, 19p., In Spanish with English and French summaries. 13 refs.**

Age determination was carried out on *Notothenia gibberifrons* specimens collected at two localities of the South Shetland Is.: Law I. and Potter Cove. Samples were composed of small and medium size fishes (14.8-38 cm of total length). Otolith and scale readings were compared; some of the scale readings resulted in overestimation of the fish age by one year. Age determination by otolith cross section proved to be the most reliable method. Data obtained confirm that fishes from the Antarctic Peninsula subarea are smaller than those around South Georgia of the same age group. Possible reasons for these differences are discussed. It is expected that the Otoliths/-Scales/Bones Exchange System established by CCAMLR will contribute to the elimination of discrepancies in age and growth studies of antarctic fishes. (Auth. mod.)

B-44041

Bester, M.N., **Population trends of subantarctic fur seals and southern elephant seals at Gough Island, South African journal of antarctic research**, 1990 20(1), p.9-12, 18 refs.

The subantarctic fur seal (*Arctocephalus tropicalis*) population at Gough I. in the South Atlantic Ocean is continuing to increase rapidly since its recovery from exploitation. The intrinsic rate of increase is however slowing down on established breeding colony beaches in the western sector as congested conditions develop. The rate of increase on the more recently colonized breeding colony sites on the east coast is high, but some beaches here remain unexploited by breeders despite the increased density on the west coast. The small breeding population of southern elephant seals (*Mirounga leonina*) either has remained stable, or declined very slowly, over the past 17 years. (Auth.)

B-44042

Brown, C.R., Klages, N.T., Adams, N.J., **Short and medium-term variation in the diets of penguins at Marion Island, South African journal of antarctic research**, 1990 20(1), p.13-20, 30 refs.

Seasonal (within a breeding season) and year-to-year changes in the diets of the four species of penguins breeding at Marion I. are reviewed. King and gentoo penguins, which are resident at the island throughout the year, show seasonal changes in the relative proportions of different prey types (fish, cephalopods and crustaceans) consumed. However, the few available data suggest that prey species of king penguins vary little from year-to-year, whereas those of gentoo penguins show some variation. In contrast to king and gentoo penguins, macaroni and rockhopper penguins show marked seasonal and annual variation in both the relative proportions of prey type consumed and the species composition of their diets. Seasonal changes reflect changes in their foraging behavior during chick-rearing, but year-to-year changes are probably related to hydrographic events, which are known to occur in the vicinity of the island and which alter prey species composition and availability. (Auth.)

B-44046

Öresland, V., Pleijel, F., **Ectoparasitic typhloscolecid polychaete on the chaetognath *Eukrohnia hamata* from the Antarctic Peninsula, *Marine biology*, Apr. 1991 108(3), p.429-432, 10 refs.**

Plankton samples taken between Dec. 1986 and Mar. 1987 from Hughes Bay yielded specimens of *Eukrohnia hamata* with a probably undescribed typhloscolecid polychaete, tentatively assigned to the genus *Typhloscolex*. The polychaete was attached behind the head of the chaetognath. A description of the polychaete is provided from scanning electron microscopy (SEM) and light microscopy studies. It is suggested that the polychaete parasitises *E. hamata*, possibly by feeding on coelomic fluid, and that as a result of the injuries the chaetognath eventually loses its head. Between 0.5 and 1.6% of chaetognaths were either parasitized or headless. In conjunction with an

investigation on feeding of antarctic chaetognaths, specimens infested with polychaetes and specimens without heads were sorted. In this paper their temporal occurrence and a brief morphological description of the polychaete are given. (Auth.)

B-44065

Parker, B.C., Angino, E.E., **Environmental impacts of exploiting mineral resources and effects of tourism in Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.237-258, 132 refs.

Whereas exploitation of nonrenewable resources of Antarctica awaits future exploration, discovery, and implementation of new technology, these developments are sufficiently near that a review of the environmental consequences is both justified and urgently needed. On the basis of present knowledge, there appears to be no compelling scientific reason for the banning of resource exploration, provided sufficient Specially Protected Areas are established and exploration, development, production, and exploitation are conducted with all necessary precautions to minimize or prevent environmental impacts. A careful and complete risk assessment for each mining operation projected and a meaningful program of risk management must be required. Presently, insufficient information on biologically important interactions is available to enable management and policy decisions to be made. This is of considerably less importance away from the coast (deep inland), where biological activity appears to be nonexistent. Nevertheless, unperturbed antarctic ecosystems are poorly understood, and how environmental impacts may affect the systems is largely unknown. It is possible that qualitative differences, not yet recognized, render the antarctic ecosystems more susceptible to permanent damage than ecosystems elsewhere. Recovery from environmental insult under antarctic conditions will be extremely slow. (Auth. mod.)

B-44074

Mathiesen, S.D., Aagnes, T., **Microbial digestion in Norwegian reindeer on South Georgia**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.27-35, 7 refs.

Reindeer are ruminants and depend on highly specialized microorganisms in the rumen to digest the plants they eat. Lichens have a substantially different chemistry than vascular plants, and consequently profound differences in rumen microbial metabolism might be expected in animals fed vascular plants as compared with those eating lichen. The aim of an investigation during NARE 1989/90 was to compare the digestive physiology of reindeer on South Georgia with reindeer in Norway to find out if the reindeer on South Georgia have the same composition of rumen microorganisms; if new rumen organisms have developed; if some organisms were lost in the original animals due to transport stress in the original reindeer across the equator; if the utilization of vascular plants is more efficient; and if rumen and cecum volumes are different in the two groups.

B-44075

Saether, B.E., Andersen, R., Pedersen, H.C., **Studies on the factors determining variation in the reproductive success of the Antarctic Petrel *Thalassoica antarctica* in Svarthamaren, Mühlig-Hofmannfjella**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.37-41, 11 refs.

Basically, the explanations which have been proposed for the low reproductive rate of seabirds can be divided into two major hypotheses. First, based on sensitivity analyses of life history models, it has been suggested that seabirds invest only a small part of their

available resources into reproduction, because a large investment in reproduction is likely to increase the female's probability of dying. The second set of hypotheses proves that the low reproductive rate of seabirds is due to limited supply of resources during or just before the breeding season. The purpose of the present study in NARE 1989/90 is to experimentally test the predictions from those two hypotheses. According to the resource limitation hypothesis, one would expect that birds cannot increase their reproductive effort as a response to an experimentally induced demand for increased reproductive investment. On the contrary, birds should be able to increase their investment if they are not resource-limited during the breeding season.

B-44076

Pedersen, H.C., **Aspects of reproductive behaviour in a population of South Polar Skua *Catharacta maccormicki* in Dronning Maud Land**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.43-45, 9 refs.

Most South Polar Skua *Catharacta maccormicki* populations studied are found at the coast of the antarctic continent, often feeding on krill and fish, or scavenging on refuse or penguins. According to one source, breeding has been documented only in one inland population found in the Theron Mountains, whereas breeding is probable but not well documented in Dronning Maud Land and Marie Byrd Land. However, in 1985 about 50 breeding pairs of South Polar Skua were found at Svarthamaren in Mühlig-Hofmannfjella. At Svarthamaren the skua was found breeding in association with colonies of Antarctic Petrel and Snow Petrel and the skuas were totally dependent on the petrels as food. During this NARE 1989/90 study, answers were sought to the following questions: does territorial behavior limit breeding numbers; to what extent do possible replacement birds adopt chicks of widowed birds; and is breeding success correlated with territory size?

B-44077

Röv, N., **Studies of breeding biology of Antarctic Petrel and Snow Petrel in Mühlig-Hofmannfjella, Dronning Maud Land**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.47-51, 9 refs.

The main objectives originally proposed for this project under the NARE 1989/90 expedition were to study the energy flow from marine to terrestrial ecosystems, establish a monitoring system for future surveillance of the Antarctic Petrel colony at Svarthamaren, and study the interactions in the predator-prey situation between the Antarctic Petrel and the South Polar Skua. There was also an opportunity to make some comparative studies of the breeding biology of the Snow Petrel *Pagodroma nivea*, another species which inhabits the area.

B-44078

Strömme, A., **Ecophysiological adaptations in mites and collembolans in Dronning Maud land**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.53-57, 4 refs.

In NARE 1989/90, three sites near Troll Station were of special interest because of the large numbers of the following species which were found: *Cryptopygus sverdrupi* (collembola), *Maudheimia wilsoni* (oribatid mite), and *Tydeus erebus* (prostigmatid mite). These studies concentrated on the oribatid mite *M. wilsoni*. The animals were found underneath a wide variety of stones. However, they appeared to prefer pelitic gneisses with approximate dimensions of 15 cm x 15 cm x 3 cm. All life stages (nests of eggs, larvae, nymphs and adults) were often found on one single stone. The adults seemed to roam about, and were quite active when exposed to high temperatures.

The earliest life-stages were often found in clusters, and appeared to be relatively inactive. This distribution pattern indicates that the animals carry out their life cycle, presumably except parts of the adult stage, within a range of a few square centimeters. The microclimate for the mites was studied. The air temperatures above the ground were rarely above 0 C, however, the animals experienced temperatures up to 20 C for several hours on sunny days. Even at night, the microhabitat temperature was considerably higher than the air temperature due to heat storage in the ground.

B-44087

Gulliksen, B., Lönne, O.J., Hellum, C., **Marine biological studies in the Weddell Sea and north of Dronning Maud Land**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.131-138, 5 refs.

More than 70 spp. have been identified from the material of collected ice algae during NARE 1989/90. About 18 spp. were common in most of the samples. Diatoms, dinoflagellates and different types of small flagellates were recorded; diatoms were most abundant. High concentrations and diversity of algae occurred in the slush-like surface layers near the snow/ice-interface called the infiltration layer. This assemblage consisted of both ice algae and phytoplankton. There were several types of ice algae assemblages on the underside of the ice. A network of the species *Berkleya rutilans* was recorded at some locations. However, long strands of algae, often dominated by the species *Amphiprora* sp. hanging into the water column from the underside of the ice were more common, especially early in the cruise. Of special interest were the swarms of krill occurring under the ice at localities north of Dronning Maud Land. Densities were estimated based upon observation and counting; the highest mean density at a diving station was approx. 70 individuals/sq m. Mean values between 20 and 30 individuals/sq m were observed at several localities.

B-44120

Wirth, V., **What causes the seasonal cycle of stationary waves in the southern stratosphere**, *Journal of the atmospheric sciences*, May 1, 1991 48(9), p.1194-1200, 20 refs.

Stationary planetary waves in the southern stratosphere display a characteristic seasonal cycle. Previous research based on a one-dimensional model suggests that this behavior is mainly determined by seasonally varying transmission properties of the atmosphere with respect to wave propagation. The issue is investigated with the help of a hemispheric, linear, quasi-geostrophic model. It reproduces well some of the observed qualitative features and is internally consistent in the sense that its seasonal wave cycle can be explained in terms of varying wave transmission properties of the mean circulation. On the other hand, the model does not yield the observed seasonal cycle. Despite considerable sensitivity to modifications in the basic-state wind and dissipation parameterization, the model could not be reasonably fit to reproduce the observed seasonal cycle. Possible reasons for the model deficiency are put forward. In summary, even though suggestive, the present study is not entirely conclusive about the degree to which the observed cycle is determined by wave transmission properties alone. The model covers the area from 10S to about 85S from Apr. through Oct. (Auth.)

B-44123

Oehme, H., **Birds around Bellingshausen Station** [Die Vögel des Gebietes um die sowjetische Antarktisforschungsstation "Bellingshausen"], *Beiträge zur Vogelkunde*, 1990 36(5), p.273-282, In German with English summary. 28 refs.

A check-list of the birds of the area around Bellingshausen Station on King George I. is presented, compiling the observations from 8

antarctic expeditions during the past 10 years. Thirty (28) species were known to occur in the region of the South Shetland Is. and 27 of them were found in the Bellingshausen district. Seventeen species breed in the whole region and 13 of them do so in the above mentioned area under continuous observation. Additionally, 7 (5) new vagrant species for the South Shetland group were ascertained. (Auth.)

B-44125

Roby, D.D., **Diet and postnatal energetics in convergent taxa of plankton-feeding seabirds**, *Auk*, Jan. 1991 108(1), p.131-146, 68 refs.

To evaluate the influence of diet composition on seabird postnatal development, relationships were examined among feeding rate, energy intake, energy partitioning, and chick growth in three species of high latitude, plankton-feeding seabirds: Least Auklet (*Aethia pusilla*), South Georgia Diving Petrel (*Pelecanoides georgicus*), and Common Diving Petrel (*P. urinatrix*). Average dietary lipid content varied from 22 to 46% of dry mass among the three species. Lipid content of antarctic krill was insufficient to meet maintenance energy requirements of common diving petrels. Lipid-rich diets were associated with shorter brooding periods, higher rates of nestling fat deposition, and larger lipid reserves at fledging. Accumulation rates of lipid-free dry matter were similar in the three species despite differences in energy intake related to diet. The energy cost of growth was a relatively minor component of nestling energy budgets; most assimilated energy was allocated toward maintenance and fat deposition. Selection apparently favors high latitude seabirds that meet the high energy requirements of their chicks by providing a lipid-rich diet. Differences in diet composition explained much of the variation in postnatal development among the three species, but there was no evidence that energy limited growth per se. (Auth. mod.)

B-44126

Tiefenbacher, L., ***Eualus kinzeri*, a new hippolytid shrimp from the Weddell Sea (Antarctica)**, *Spixiana*, July 31, 1990 13(2), p.117-120, 3 refs.

A new species of the family Hippolytidae, *Eualus kinzeri*, spec. nov., is described from the eastern Weddell Sea. It is the first species of this genus found beyond the Antarctic Circle. The species seems to be closely related to *Eualus gaimardii* (H. Milne Edwards, 1837), which is known to be circumarctic. (Auth.)

B-44131

Nolan, C.P., **Size, shape and shell morphology in the antarctic limpet *Nacella concinna* at Signy Island, South Orkney Islands**, *Journal of molluscan studies*, Apr. 1991 57(2), p.225-238, Refs. p.237-238.

Comparison of the size, shape and shell morphology in littoral and sub-littoral morphs of the antarctic limpet *Nacella concinna* reveal differences in shell morphology which are enhanced by structural anomalies within the shells of the two types. Infestation of sub-littoral shells by the *conchocelis* phase of an endolithic alga significantly affects shell density and total chlorophyll levels in the two shell morphs. The surface sculpture of sub-littoral shells is characterized by a series of grooves, the configuration of which closely resembles that of the radular teeth in *N. concinna*. The Dominican Gull, *Larus dominicanus*, is a major shore predator of both shell morphs. Gull middens contain both shell types but are dominated by the more accessible littoral shells. Comparison of living populations and midden assemblages indicates that size and shape selection of prey occurs, with pear-shaped limpets between 21 mm and 29 mm in length being taken preferentially. Littoral animals are robust in nature, resist avian predation and are not extensively grazed, whereas those of the sub-littoral are not subject to the same degree of predatory attention but suffer a gradual depletion of their shallower shell form through a combination of algal infection and intraspecific shell grazing. (Auth. mod.)

B-44137

Ghebremeskel, K., Williams, T.D., Williams, G., Gardner, D.A., Crawford, M.A., **Plasma metabolites in macaroni penguins (*Eudyptes chrysolophus*) arriving on land for breeding and moulting**, *Comparative biochemistry and physiology*, 1991 99A(1/2), p.245-250, Refs. p.249-250.

Plasma metabolites and nutrients of macaroni penguins (*Eudyptes chrysolophus*) arriving on land in good condition, following intense feeding, for breeding and moulting were investigated. The pre-breeding female birds had significantly higher concentrations of total lipid, iron, magnesium, calcium, inorganic phosphate and alkaline phosphatase, and lower concentrations of total cholesterol and all-trans retinol (vitamin A) than the pre-breeding males. With the exception of iron, which was lower in the male, the various parameters measured in male and female pre-moult penguins did not differ. Some of the plasma metabolite concentrations of the pre-moult birds differed substantially from those of their male and female pre-breeding counterparts. The observed differences were thought to be the result of mobilization in response to physiological demands for egg formation and moulting. It is possible that discrepancies were partly due to selective ingestion of nutrients in preparation for higher physiological demands. (Auth.)

B-44139

Itoh, S., Takenaga, F., Tsuyuki, H., **Studies on lipids of the antarctic minke whale. 1. Fatty acid components of the minke whale blubber oils caught in 1987/88 season**, *Japan Oil Chemists Society. Journal*, 1990 39(7), p.486-490, In Japanese with English summary. 14 refs.

Determination was made of fatty acid components of minke whale blubber oils obtained from 8 immature males, 1 maturing male, 16 mature males, 4 immature females and 9 mature females (pregnant) caught in the Antarctic Jan.-Mar. of 1988. Oil content varied widely from 11.9% to 52.1%, according to the sex and the age of the animal. All blubber oils contained about 45 fatty acid components varying in composition. The major fatty acids were 18:1, 16:1, 16:0, 20:5, 14:0 and 22:6, where *n:m* indicates fatty acids with *n* carbon atoms and *m* e=c double bonds. (Auth. mod.)

B-44140

Tanimura, A., Fukuchi, M., Ohtsuka, H., Hoshiai, T., **Zooplankton data collected with BIOMASS Programme at Syowa Station in 1982 by JARE-23. 2. "NIPR-1" samples: Stn. 3, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1991 No.162, 275p., 3 refs.

This report summarizes the data on zooplankton collected with a NIPR-1 sampler at Stn. 3 during the JARE-23 overwintering program in 1982. A total of 272 samples were obtained with modified NIPR-1 sampler from 8 layers between 0 and 40 m depths during Mar. through Dec. of 1982. The sampling system of the modified NIPR-1 sampler is shown. The results of the primary sorting are presented. Zooplankton were sorted into 29 categories, which are shown in tables. Copepoda were comprised of Calanoida, Cyclopoida and Harpacticoida. Euphausiacea were counted separately for the nauplius stages and the other stages. Eggs include those of crustacean and benthic invertebrates, etc. Planktonic larval forms include benthic invertebrate larvae other than Polychaeta.

B-44145

Davis, L.S., ed, Darby, J.T., ed, **Penguin biology**, San Diego, CA, Academic Press, 1990, 467p., For selected papers see B-44146 through B-44155.

DLC QL696.S473P44 1990

This book is intended to be the state-of-the-art of penguin research as of Aug. 1988, and is based on papers presented at the First International Conference on Penguins, held in Dunedin, New Zealand, Aug. 16-19, 1988. It is not intended to be a conference pro-

ceedings, since these chapters represent only about one third of the total conference presentations. For the Bibliography, the total is further reduced as those papers not dealing with Antarctica or the islands of Subantarctica are excluded. The selected papers focus mainly on the emperor, king, gentoo, Adélie, and chinstrap species, emphasizing their behavior and physiology in matters of procreation, including courtship, diets, metabolism, foraging, diving, fasting, and circadian rhythms.

B-44146

Bost, C.A., Jouventin, P., **Evolutionary ecology of gentoo penguins (*Pygoscelis papua*)**, *Penguin biology*, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.85-112, Refs. p.109-112.

DLC QL696.S473P44 1990

This paper comprises both an original comparative study and a synthesis of available data on the ecology of the gentoo penguin. All data concerning Crozet and Kerguelen Islands that are given without references are data published for the first time. It is noted that everywhere within its range it is an inshore feeder, as shown by the relative low breeding synchrony, the length of brooding shifts, the foraging range and the potential to rear two chicks. Inshore feeding appears to be the key feature determining the biology of the species. The gentoo penguin is closely dependent on the availability of local resources. Local feeding conditions (abundance, predictability, and variety of resources) influence its breeding ecology at least as much as physical factors, both between localities and within the same locality. Extreme situations are often the most instructive in evolutionary ecology. It is at the northern extreme of the gentoo's range that the authors have seen most clearly the selective constraints and the adaptive capacities of the species. Gentoos in northern localities have the greatest variability in biometry, population size, timing of laying, diet, growth rate, foraging range, and foraging and breeding success. But this north-south gradient is not continuous all the way to the southern limit of the gentoo's range. Although data are not numerous for the Antarctic Peninsula, population sizes appear to decrease here, where climatic conditions are probably limiting. The preliminary study on Kerguelen Is. has indicated the possible range of local variations, and the comparison of Crozet with South Georgia I. has helped in appreciating the range of ecological adaptations by this species.

B-44147

Trivelpiece, W.Z., Trivelpiece, S.G., **Courtship period of Adélie, gentoo, and chinstrap penguins**, *Penguin biology*, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.113-127, 27 refs.

DLC QL696.S473P44 1990

The study site at Admiralty Bay, King George I., is within the zone of overlap, where populations of the three species breed together at several rookeries. It is argued that the breeding strategies of the three *pygoscelid* species primarily evolved in different areas under differing environmental conditions, and each species may be historically constrained by these patterns throughout their respective ranges. In addition, the patterns, although very different (i.e., gentoos, nonmigratory, nonfasting; Adélies, migrating, long fasts; and chinstrap, migratory, intermediate fasting times), all work reasonably well in the highly variable Antarctic Peninsula region, where the ranges of the three species overlap. Hence, there may have been little selective pressure for change. Finally, there may be critical features of the environments experienced by each species that act with equal importance, across wide latitudinal ranges, and the fringe of each species' range may not be suboptimal breeding habitat, but rather the edge of a sharply defined boundary limiting each species. For instance, the daily nest exchanges and lack of fasting of gentoos require predictable ice-free seas, and their breeding strategy is successful at any breeding site that affords this environmental feature. The breeding pattern of Adélies, involving courtship fasting and long incubation shifts, may have evolved as a means of exploiting nearby pack ice areas, the only places where food can predictably be found in early springtime.

B-44148

Cooper, J., **Diets and dietary segregation of crested penguins (*Eudyptes*)**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.131-156, Refs. p.153-156.

DLC QL696.S473P44 1990

Crested penguins of the genus *Eudyptes* have a wide distribution at subantarctic and southern cold temperate islands. The six or seven extant species vary little, except in size and the color and shape of their head crests. At some breeding localities, two species of crested penguins breed. Such sympatry suggests that dietary segregation could exist, but the early, mainly anecdotal, information on the diets of crested penguins was insufficient to show typical diets and how much variation occurred between species and between breeding localities. Quantitative studies of the diets of crested penguins carried out in the 1980s, using essentially the same methods of collection and analysis, now permit comparisons between species and localities. Most importantly, such comparisons can be made at four localities where two species of crested penguins coexist. In this chapter, what is known of the diets of crested penguins is reviewed with special emphasis on differences of sympatrically breeding species.

B-44149

Sadleir, R.M.F., Lay, K.M., **Foraging movements of Adélie penguins (*Pygoscelis adeliae*) in McMurdo Sound**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.157-179, 31 refs.

DLC QL696.S473P44 1990

This paper reports some results of the initial attempt to "flight follow" foraging Adélie penguins in McMurdo Sound by attaching radio transmitters to the breeding birds. The communications equipment and its limitations are described and tracking methods are explained. The results indicate that it is a feasible, useful program which is awaiting logistical access to enable the provision of more and better data on the Adélies' foraging behavior.

B-44150

Croxall, J.P., Davis, R.W., **Metabolic rate and foraging behavior of *Pygoscelis* and *Eudyptes* penguins at sea**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.207-228, 44 refs.

DLC QL696.S473P44 1990

Foraging on aggregated krill is obviously likely to be a productive technique for penguins. When the swarm is dispersed, however, krill densities approach the threshold values of catching density for penguins with dependent chicks. Krill which are not part of swarms probably do not offer penguins an economically exploitable resource. For krill-eating penguins, therefore, the key to successful rearing of offspring may lie in their ability to locate krill swarms. From the analysis of the data two interpretations are suggested: during parental foraging trips the average daily energy costs are stable or decrease with increasing time at sea; and parents do not seek to return to feed chicks at fixed time intervals (which would result in trips of fairly constant duration but very variable delivered meal mass) but appear to try to return with at least some minimum load.

B-44151

Kooyman, G.L., Ponganis, P.J., **Behavior and physiology of diving in emperor and king penguins**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.229-242, 28 refs.

DLC QL696.S473P44 1990

A few aspects of behavior and physiology of diving in penguins are discussed, with special reference to king and emperor penguins. The central issues deal with the major behavioral components of diving, namely (1) dive depth, (2) dive duration, (3) surface interval between dives, and (4) swim speed, as well as some physiological effects arising from these variables. Dive depths observed for emperor

and king penguins, as well as the dive duration and surface interval determined for emperor penguins, tend to undermine present concepts about how diving birds avoid decompression sickness and nitrogen narcosis. Earlier conclusions were derived from compression studies on gentoo and Adélie penguins, and those results do not explain well how king and emperor penguins avoid the hazards of deep diving. Some of the swim speeds and dive durations measured in emperor penguins seem too great to fit with the present concepts about aerobic dive limits, which originated from measurements obtained with seals. It would seem either that the metabolic rate for the speeds observed is less than present laboratory and field data indicate, or that there is a large anaerobic component to the dives. Low aerobic metabolism at such high swim speeds seems physically impossible. Yet, a large supplement of anaerobic metabolism seems unlikely owing to the time to recover from the metabolic acidosis that would ensue, and the observed short surface intervals in which most of the recovery would take place. An explanation by either option is unsatisfactory.

B-44152

Green, B., Gales, R.P., **Water, sodium, and energy turnover in free-living penguins**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.245-268, 41 refs.

DLC QL696.S473P44 1990

In this review are collated all the published literature concerned with free-living energetics of penguins. Results of recent work not yet published are also included. The isotope turnover technique is discussed as far as it applies to studies on penguins, followed by the results of studies of adult penguins when restricted to land (i.e., during moult incubation, brooding) and when undertaking foraging trips. Also considered are rates of food consumption by chicks and the energetics of chick growth, which have recently been studied in six species using isotope turnover techniques. Where data are sufficient, sexes are compared and intraspecific variations between populations at different geographic locations are examined. Some rudimentary annual energy budgets are constructed, which are at least a progression toward arriving at realistic determinations of the energy and food requirements of this group of birds. The allometry of the physiological parameters is inspected in order to evaluate the status of the present database and indicate where future efforts would be most beneficially directed.

B-44153

Groscolas, R., **Metabolic adaptations to fasting in emperor and king penguins**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.269-296, Refs. p.292-296.

DLC QL696.S473P44 1990

How penguins manage to tolerate long-term food deprivation, and yet provide energy and materials for the metabolic requirements essential for maintaining whole body homeostasis and for breeding, is the focus of this paper. During molting fasts, considerable metabolic changes are related to feather renewal rather than to fasting, thus impairing a clear assessment of the adjustments to fasting itself. Therefore, molt physiology is not considered. The focus is on the breeding fast (courtship plus incubation) in the two species in which adaptation to fasting is best studied, the emperor and the king penguins. References to the winter fast of king penguin chicks are also made. How energy is spared, how the utilization of fat reserves allows protein sparing and modifies adipose tissue cellularity and composition, and the physiological limits of resistance to fasting, are considered in turn.

B-44154

Adams, N.J., Brown, C.R., **Energetics of molt in penguins**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.297-315, Refs. p.312-315.

DLC QL696.S473P44 1990

Penguins have an intense molt, during which time they are confined to land. Ratios of molt cost to resting metabolic rate varied from 1.07 to 2.27 times the RMR for estimates based on rates of loss of body mass and isotope turnover. Oxygen consumption measurements indicate that mass-specific metabolism fluctuates through molt, and peaks during the loss of old feathers. Although attempts to relate these changes directly to patterns of feather synthesis and associated changes in insulative properties of the integument have been made, evidence of a direct link is unconvincing at present. A decrease in thermal insulation during feather loss has been suggested as inducing the increase in energy metabolism. Foraging effort during the pre-molt period, when penguins accumulate energy reserves, was higher than that of adults attending chicks. Future research on the energetics of molt should examine the thermoregulatory responses of molting penguins to changes in their physical environment, in order to separate costs of thermoregulation from costs due to feather growth and synthesis.

B-44155

Cockrem, J.F., **Circadian rhythms in antarctic penguins**, Penguin biology, edited by L.S. Davis and J.T. Darby, San Diego, CA, Academic Press, 1990, p.319-344, Refs. p.340-344.

DLC QL696.S473P44 1990

Antarctic penguins maintain daily activity rhythms during the summer, with little known about activity in the winter. The clarity of the different rhythms declines in midsummer and is related to the amplitude of the daily cycle of light intensity to which the penguins are exposed. Antarctic penguins live in an open environment and breed in large rookeries close to other penguins. They do not have a clear pattern of sleep and wakefulness; rather, individuals have short periods of rest and activity throughout the day. These characteristics, together with the constant opportunities for interactions between birds, reduce the clarity of activity rhythms. Overall, however, antarctic penguins maintain rhythms of activity during the relatively constant conditions of the summer. Adélie and probably other antarctic penguins maintain daily rhythms of body temperature during the antarctic summer. The clarity and frequency of occurrence of these rhythms probably decrease during the summer. The relationship between body temperature rhythms under the diurnally changing but nonetheless continuous light and those under light/dark cycles shows lower amplitude and less square waveform in the natural continuous light. Pineal gland function in antarctic penguins is similar to that of other birds. It is likely that antarctic penguins have a circadian rhythm of melatonin secretion that is entrained by the daily cycle of light intensity, with low levels of melatonin in summer because of the suppressive effect of light on melatonin secretion. The pineal gland is not especially large or complex, and there is no evidence of special adaptations to the unusual conditions of continuous daylight.

B-44161

Thomsen, H.A., Buck, K.R., Coale, S.L., Garrison, D.L., Gowing, M.M., **Loricata choanoflagellates (Acanthoecidae, Choanoflagellida) from the Weddell sea, Antarctica**, *Zoologica scripta*, 1990 19(4), p.367-387, 37 refs.

A study of the choanoflagellate species composition of an antarctic ice edge zone (northern Weddell Sea, Mar. 1986) has resulted in the finding of 16 taxa of which one, *Cosmoeca takahashii* Thomsen sp.n., is described here. An emended description is given of *Parvicorbicula circularis*. Morphological, numerical and dimensional aspects of other species have been analyzed in an attempt to improve

the circumscription of certain taxa, and to increase understanding of the nature of intraspecific variability. Data on the relative abundance of choanoflagellate species along seaward transects perpendicular to the ice edge showed that seven species account for more than 95% of all choanoflagellates identified. The two most abundant species were *Parvicorbicula socialis* and *Diaphanoeca pedicellata*. (Auth.)

B-44162

Buck, K.R., Marchant, H.J., Thomsen, H.A., Garrison, D.L., ***Kakoeca antarctica* gen. et sp.n., a loricata choanoflagellate (Acanthoecidae, Choanoflagellida), from antarctic sea ice with a unique protoplast suspensory membrane**, *Zoologica scripta*, 1990 19(4), p.389-394, 34 refs.

A new genus and species of loricata choanoflagellate, *Kakoeca antarctica* Buck & Marchant gen. et sp.n., grown in rough culture from an antarctic sea ice innoculum, is described. This organism has a distinctive lorica morphology consisting of more than 200 costal strips arranged in transverse and longitudinal costae that are perpendicular to one another in the posterior portion of the lorica. The transverse costae show declination with respect to the lorica axis in the anterior part of the lorica. The cell is suspended in the lorica by a robust protoplast suspensory membrane. This membrane blocks water flow from the posterior of the lorica, necessitating water entry through the side of the lorica, an area where the maximum sized apertures in the lorica are found. Terminology (lorica lining and protoplast suspensory) is suggested for the two types of lorica membranes which have been found associated with loricas. (Auth.)

B-44166

Atkinson, A., **Life cycles of *Calanoides acutus*, *Calanus simillimus* and *Rhincalanus gigas* (Copepoda: Calanoida) within the Scotia Sea**, *Marine biology*, May 1991 109(1), p.79-91, Refs. p.90-91.

The life cycles and distribution of three dominant copepods, *Calanoides acutus*, *Calanus simillimus* and *Rhincalanus gigas* were studied from the "Discovery" collections in the Scotia Sea earlier this century. *C. simillimus* is a subantarctic species which mates in the top 250 m mainly in spring, and remains in the surface layers for a longer period than *Calanoides acutus* or *R. gigas*. Its depth distribution is bimodal throughout the winter. *R. gigas* is most abundant in subantarctic waters to the north of the Polar Front. It mates within the top 750 m later in spring, and development seems less synchronized than that of the other two species, with egg laying and the growth season being more protracted. The predominantly antarctic species, *C. acutus* mates below 750 m in middle to late winter, and the summer generation develops rapidly to either CIV or CV. Its lifespan seems typically 1 yr, but some of the CVs which fail to moult and spawn in winter survive into their second summer, and their subsequent fate is uncertain. The cold-water species *Calanus propinquus* is comparatively rare in the Scotia Sea and aspects of its distribution and life cycle are briefly described for comparison. Regional variations in the timing of these events were apparent for *C. simillimus* and possibly *C. acutus*, but were not seen in *R. gigas*. (Auth. mod.)

B-44169

Eslake, D., Kirkwood, R., Burton, H., Wang, Z.P., **Temporal changes in zooplankton composition in a hypersaline, antarctic lake subject to periodic seawater incursions**, *Hydrobiologia*, Mar. 1, 1991 210(1-2), p.93-99, 7 refs.

In this paper, colonization of Lake Fletcher, a hypersaline, meromictic lake in the Vestfold Hills, by the calanoid copepod *Drepanopus bispinosus*, the cyclopoid copepod *Oncea curvata* and an undescribed cydippid ctenophore is discussed. In 1978, salinity directly under the ice was 66 per mill and repeated net hauls found no zooplankton. In 1983, adults of *D. bispinosus* were found, and in 1984,

a reproductively active population of this species was identified. By winter 1986 three zooplankton species had established populations in the lake. In 1986/87, high tides caused nearby Taynaya Bay to flood into the lake, and three further species were found in the lake. It appears that periodic flooding after 1978 caused a salinity decrease in the lake from 66 to 54 per mill, which enabled some invertebrate species to maintain year-round populations, whereas others require marine incursions to re-establish summer only populations. (Auth. mod.)

B-44219

Agatha, S., Wilbert, N., Spindler, M., Elbrächter, M., **Euplotide ciliates in sea ice of the Weddell Sea (Antarctica)**, *Acta protozoologica*, 1990 29(3), p.221-228, 10 refs.

Euplotes algivora n. spec., *Cytharoides australis* n. spec. and *Cytharoides balechi* are euplotide from the sea ice of Antarctica. Their morphology and infraciliature are described and a new definition of the genus *Cytharoides* is given. (Auth.)

B-44220

Wasik, A., Mikolajczyk, E., **Tintinnids near pack-ice between South Shetland and South Orkney Islands (26 Dec. 1988-18 Jan. 1989)**, *Acta protozoologica*, 1990 29(3), p.229-242 + plates, 50 refs.

In total, 19 species of suborder *Tintinnina* were identified in the Admiralty Bay, Bransfield Strait and in the region between Elephant I. and the South Orkney Is. *Cymatocylis convallaria* was not only the most frequent but also the most abundant species at the particular station and at the whole studied area. *Tintinnina* cells occurred mainly in the upper 50 m of the water column. In the sea ice samples only empty loricas were recorded. The *Tintinnina* community showed no correlation with the location of the edge of the ice. (Auth.)

B-44221

Abyzov, S.S., **Features of the ultrastructural organization of yeast isolated from the ice sheet of an antarctic glacier** [Ob osobennostiakh ul'trastrukturnoi organizatsii drozhzhevykh kletok iz tolshchi antarkticheskogo lednika], *Akademiia nauk SSSR. Izvestiia. Seriya biologicheskaya*, Nov.-Dec. 1983 No.6, p.914-922, In Russian with English summary. 35 refs.

Vital yeasts *Rhodotorula glutinis* and *Cryptococcus albidus* were isolated from the ice sheet of the Central Antarctic Glacier near Vostok Station. The age of the glacier layers in which these organisms were found was estimated to be 700-3250 years old. On the basis of the comparative electron-microscopy studies of ultra-thin sections of the yeast, isolated from the ice sheet of the Antarctic Glacier, and the strains of the same species of the collection, the changes in the cellular structures (mitochondria, nuclei) of the glacier cultures were established. (Auth.)

B-44224

Cuzin-Roudy, J., Amsler, M.O., **Ovarian development and sexual maturity staging in antarctic krill, *Euphausia superba* Dana (Euphausiacea)**, *Journal of crustacean biology*, May 1991 11(2), p.236-249, 35 refs.

A new method for staging sexual development of female krill, and a key which can be used for live animals and Formalin-fixed samples, are presented. The key takes into account female general appearance, thelycum development, ovarian morphology, and developmental steps of changes in the ovarian cells. This staging method is based on the results of a histological study of ovarian development, but the use of the key itself involves only simple observations and rapid execution of a squash from a piece of the ovary. The reproductive cycle

of krill is divided into 10 stages: 8 stages for ovarian development leading to egg production, and 2 stages for sexual regression and reorganization after spawning periods. It is believed that such a method could be useful for predicting spawning events and their timing for antarctic krill, and for a better estimation of fecundity and related energy requirements. Similar keys devised for other euphausiids and free-spawning pelagic crustaceans will allow comparisons among different reproductive strategies. (Auth.)

B-44229

Lizotte, M.P., Sullivan, C.W., **Photosynthesis-irradiance relationships in microalgae associated with antarctic pack ice: evidence for in situ activity**, *Marine ecology progress series*, Apr. 11, 1991 71(2), p.175-184, Refs. p.183-184.

Microalgae associated with a broad range of pack ice microhabitats were examined for photosynthesis-irradiance characteristics in relation to light availability. Pack ice was sampled from the Weddell-Scotia Sea and west of the Antarctic Peninsula during the austral autumn and winter. Microalgae from pack ice exhibited lower photosynthetic capacity and I_k values at greater depths within profiles of annual ice, and lower predicted irradiance levels. Proportional relationships between photosynthetic characteristics and irradiance are interpreted to represent photoadaptation by microalgae following their incorporation into a vertically growing ice sheet; this interpretation provides the first evidence of in situ physiological activity of microalgae within pack ice. Relative to the fast ice microalgae previously studied, pack ice microalgae had photosynthetic capacity and I_k values, and inhabited microenvironments exposed to higher irradiances. It is concluded that rates of primary production by pack ice microalgae could be much higher than previously estimated from studies in fast ice regions, and that sea ice microalgae have the potential to make a significant contribution to the primary production of the southern ocean, particularly during the winter and early spring when maximal ice cover significantly reduces the productivity of phytoplankton. (Auth. mod.)

B-44230

Björnsen, P.K., Kuparinen, J., **Determination of bacterioplankton biomass, net production and growth efficiency in the southern ocean**, *Marine ecology progress series*, Apr. 11, 1991 71(2), p.185-194, Refs. p.193-194.

Several conversion factors are required for the estimation of bacterial biomass, net production and carbon demand from epifluorescence microscopy and measurements of $[^3H-3j]$ -thymidine and $[^3H-3j]$ -leucine incorporation rates. These conversion factors were evaluated simultaneously in mixed cultures of bacterial assemblages from the Weddell/Scotia Confluence of the southern ocean. The cultures were grown in the dark at +1 C. Conversion factors, calculated for each culture by regression analyses of cumulative parameters, are given. (Auth. mod.)

B-44232

Hayward, P.J., **Systematic studies on some antarctic and subantarctic Ascophora (Bryozoa: Cheilostomata)**, *Linnean Society of London. Zoological journal*, Apr. 1991 101(4), p.299-335, Refs. p.333-335.

Twenty-two species of ascophoran cheilostome Bryozoa are described from antarctic and subantarctic localities. Ten new species are described in the genera *Exochella*, *Buffonellodes* and *Hippadenella*. *Ralepria* gen. nov. is introduced for *Ralepria conforma* sp. nov., and *Trilochites* gen. nov. is introduced for *Escharoides biformata* Waters, 1904. Five species described by Jullien (1888) and Calvet (1909) are redescribed following re-examination of type specimens. (Auth.)

B-44233

Wägele, H., **Studies on the morphology and anatomy of the antarctic nudibranch genera *Pseudotritonia* Thiele, 1912 and *Telarma* Odhner, 1934 with a discussion of the family Charcotiidae Odhner, 1926 (Nudibranchia: Opisthobranchia), *Linnean Society of London. Zoological journal*, Apr. 1991 101(4), p.359-389, 20 refs.**

The external morphology and anatomy of the antarctic nudibranchs *Pseudotritonia quadrangularis* Thiele, 1912, *P. gracilidens* Odhner, 1944 and *Telarma antarctica* Odhner, 1934 are redescribed. Both genera, which were only known by two or one specimen, do not possess a cnidosac, but there is a terminal swelling at the termination of the digestive glandular ramifications in *P. gracilidens*. This sac is composed of cells with a large vacuole. A glandular stripe on the right side of the body above the genital openings, nephroproct and anal papilla is considered to be a synapomorphy for both genera. The validity of the family Charcotiidae and the affinities to the aeolid genus *Notaeolidia* Eliot, 1905 and taxa of the Arminacea are discussed. (Auth.)

B-44234

Kappen, L., Schroeter, B., Sancho, L.G., **Carbon dioxide exchange of antarctic crustose lichens in situ measured with a CO₂/H₂O porometer, *Oecologia*, 1990 82(3), p.311-316, 18 refs.**

Photosynthesis and respiration of crustose lichens in their natural situation were measured by means of a Walz porometer with a modified cuvette and a plexiglass ring. Habitat influence and the specific performance of 3 maritime antarctic species were demonstrated by diurnal courses of microclimate and CO₂ exchange during rainy days. In further field experiments the photosynthetic response to soaking with water was tested. *Haematomma erythromma* is rain-exposed at its natural habitat on coastal rocks but tends to dry out quickly. The photosynthetic efficiency of the chlorophyll of this photophilous species was high. *Lecidea sciatriapha* appears to be chionophilous and had a low light compensation point of its net photosynthesis. The photosynthetic rates per surface area of these two species were low compared with those of *Caloplaca sublobulata*. According to its habitat selection *C. sublobulata* is typified as an ombrophobous lichen. This characterization was confirmed experimentally by gas exchange measurements. (Auth.)

B-44235

Karsten, U., Wiencke, C., Kirst, G.O., **Effect of light intensity and daylength on the beta-dimethylsulphonopropionate (DMSP) content of marine green macroalgae from Antarctica, *Plant cell and environment*, 1990 13(9), p.989-993, 26 refs.**

The beta-dimethylsulphonopropionate (DMSP) concentrations of 5 green algae were determined during a period of one year, cultivated under fluctuating daylengths mimicking the conditions of the natural habitat at King George I. The intracellular DMSP content of all species decreased simultaneously with decreasing daylengths and vice versa. Additionally, the DMSP level was affected by the light intensity: the higher the photon fluence rate the greater the algal DMSP concentration. During darkness, there was a degradation of the DMSP pool in members of the Acrosiphoniales, while the DMSP content in members of the Ulvales did not change. The results indicate a light-dependent DMSP accumulation in algae. Therefore, they may help to explain the seasonal variability of DMSP and its cleavage product dimethylsulphide (DMS) in coastal waters. (Auth. mod.)

B-44236

Plötz, J., Ekau, W., Reijnders, P.J.H., **Diet of Weddell seals *Leptonychotes weddellii* at Vestkapp, eastern Weddell Sea (Antarctica), in relation to local food supply, *Marine mammal science*, Apr. 1991 7(2), p.136-144, 20 refs.**

Thirteen Weddell seals (*Leptonychotes weddellii*) were collected at Vestkapp, eastern Weddell Sea coast in spring 1986. The mean wet weight of stomach contents was 3.3% of the mean body weight of the collected seals. Twelve fish species and 3 cephalopod species were identified from 372 left otoliths and 25 lower beaks, representing 58.4% of 679 total prey items obtained. Composition by number of total prey was: *Chionodraco myersi* (15.8%), *Trematomus eulepidotus* (10.0%), *Pagetopsis maculatus* (9.7%), *Racovitzia glacialis* (9.6%) and *Cryodraco antarcticus* (4.1%). Otoliths of the 7 other fish species and beaks of the pooled wet weights calculated from 13 prey species amounted to 43.5 kg food mass, and represented 44.7% of the combined food mass in all stomachs. Composition by mass was: *C. myersi* (44.5%), *T. eulepidotus* (19.8%), squid *Psychroteuthis glacialis* (8.5%), *P. maculatus* (7.9%), *C. antarcticus* (7.1%) and *R. glacialis* (6.2%). The remaining 7 fish species together represented 5.8% by mass. Temporal variation in food availability was apparent. Midwater fish *Pleuragramma antarcticum* was the staple food of Weddell seals from the same area during the 1985 summer, whereas it was absent in the samples taken in spring 1986. (Auth. mod.)

B-44253

Wise, S.W., Jr., Tjalsma, R.C., Dailey, D.H., **Late Palaeocene carbonate deposition on the Southwest Indian Ridge, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.633-637, 14 refs.**

Islas Orcadas Piston Core 12-14 taken on the southern flank of the southwest Indian Ridge south of Africa recovered upper Palaeocene nannofossil ooze at a present day water depth of 4682 m. Back-tracking the core site (presently at 58.4S; 18.3E) demonstrates that carbonate ooze deposition did occur along the more southerly segments of the Southwest Indian Ridge during the early Palaeocene, at which time the core site lay at approximately 56S in a water depth of about 2700 m. This reinforces speculations that carbonate deposition could have occurred within intracratonic basins of the antarctic continent during Palaeocene time. The nannofossil content of the core ranges from about 91 to 94%, and the high latitude coccolith assemblage can be assigned a late Palaeocene age corresponding to the high-latitude nannofossil *Heliolithus universus* Zone, which is roughly equivalent to the low-latitude Zones CP5/CP7. Seven species of planktonic foraminifera accompanied by 40 benthic species also indicate a late Palaeocene age (P4/P5). In combination, the calcareous planktonic zonations suggest an age of 59-61 Ma for the material. The 862 cm of nannofossil ooze recovered is overlain by 122 cm of dark yellowish-brown, zeolitic pelagic clay, which contains abundant micromanganese nodules. The carbonate-poor lithology apparently owes its origin to subsidence of the ridge flank sediments below the carbonate compensation depth. (Auth.)

B-44254

Toker, V., Barker, P.F., Wise, S.W., Jr., **Middle Eocene carbonate-bearing marine sediments from Bruce Bank off northern Antarctic Peninsula, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.639-644, 20 refs.**

The diverse and well preserved nannofossil assemblage (about 30 taxa) recovered from Bruce Bank is assigned to the *Chiasmolithus*

gigas Subzone of the *Nannotetrina quadrata* Zone (CP13b). A diverse group of pontosphaerids plus braarudosphaerids and rare *Lithotromotion simplex* suggest a continental-margin palaeoenvironment, shallower than the present depth of the site. Benthic foraminifera also indicate a shallower, bathyal palaeodepth of deposition (2000 to about 800 m). It is concluded that Bruce Bank probably is a continental fragment of the pre-Oligocene Antarctic-South American isthmus. It subsequently underwent rifting and subsidence in conjunction with seafloor spreading during the opening of Drake Passage. Middle Eocene nannofossil assemblages of the *N. quadrata* Zone are present on the Falkland Plateau and as reworked constituents in an Oligocene glaciomarine sequence on King George I., northern Antarctic Peninsula. A well preserved coccolith specimen of early-middle Eocene age has been reported reworked in tills of the Transantarctic Mountains. These occurrences suggest widespread deposition of lower-middle Eocene carbonate-rich or carbonate-bearing sediments throughout the high latitudes of the southern ocean, perhaps even within the cratonic basins of the antarctic continent itself. (Auth. mod.)

B-44299

Taylor, R.H., Wilson, P.R., **Recent increase and southern expansion of Adélie penguin populations in the Ross Sea, Antarctica, related to climatic warming, New Zealand journal of ecology**, 1990 Vol.14, p.25-29, 24 refs.

DLC QH540.N43

The numbers of Adélie penguins *Pygoscelis adeliae* (Hombron and Jacquinot) in the Ross Sea have increased markedly over the past 10 years. Proportionally this increase is most pronounced in McMurdo Sound, where the species' breeding range has recently been extended 3 km south to Cape Barne with the re-occupation of a former rookery that was abandoned sometime before the present century. These biological trends show remarkable synchronization with physical evidence of climatic variation in the McMurdo Sound region. It is suggested that the dynamics of Adélie penguin populations may be very sensitive indicators of changes in the antarctic climate. (Auth.)

B-44300

Brandt, A., **Antarctic valviferans (Crustacea, Isopoda, Valvifera). New genera, new species and redescriptions**, Leiden, E.J. Brill, 1990, 176p., refs. p.174-176.

DLC QL444.M34B73

Several new species of the family Arcturidae and many new localities of known species are reported from the *Polarstern* expeditions between 1983 and 1987. Several new species and a subspecies are described: *Antarcturus giganteus* n.sp.; *Antarcturus strasseni* n.sp.; *Antarcturus weddelli* n.sp.; *Antarcturus horridus serratus* n.ssp., *Antarcturus schmidtii* n.sp., *Neoarcturus minutus* n.sp.; *Neoarcturus elongatus* n.sp.; *Neoarcturus scelerosus* n.sp.; *Neoarcturus robustus* n.sp.; *Neoarcturus emarginatus* n.sp. *Dolichiscus mirabilis* n.sp. and *Edotia pulchra* n.sp. The genera *Antarcturus* and *Neoarcturus* are split into eight smaller genera. The new genera are *Oxyarcturus* n.gen.; *Chaetarcturus* n.gen. with *Chaetarcturus longispinosus* n.sp.; *Litarcturus* n.gen.; *Tuberarcturus* n.gen.; *Mixarcturus* n.gen. and *Fisarcturus* n.gen. Several species of *Edotia* are redescribed on the basis of type material. (Auth.)

B-44301

Skerratt, J.H., **Phospholipid ester-linked fatty acid composition of members of the family Halomonadaceae and genus Flavobacterium: a chemotaxonomic guide, Systematic and applied microbiology**, Jan. 1991 14(1), p.8-13, Refs. p.12-13.

The phospholipid ester-linked fatty acids (PLFA) from members of the family *Halomonadaceae* and the genus *Flavobacterium* were analyzed in detail by capillary GC and GC-MS. Precise monounsaturated double bond position and geometry was determined by GC-

MS analysis of the dimethyl disulphide adducts of the monounsaturated fatty acids. No clear distinction was observed between members of the two genera *Halomonas* and *Deleya* based upon PLFA composition. The PLFA profiles of *Flavobacterium salegens* and *Flavobacterium gondwanense*, proposed new species of moderately halophilic bacteria isolated from Organic Lake, were characterized by high abundances of i15:0, a15:0, 15:0, i15:1w10c, a15:1w10c and i16:0. The two species were distinguishable from each other based on their PLFA and hydroxy fatty acid profiles. The position of the double bond in the branched C15 monounsaturated fatty acids is unusual, and may be a taxonomic feature of these bacteria. It may also be possible to use these signature fatty acids in microbial ecology studies of antarctic saline lakes where the presence and relative importance of these bacteria is being investigated. (Auth. mod.)

B-44307

Kriss, A.E., **Ecological-geographical aspects of the distribution of heterotrophic bacteria in the Atlantic Ocean** [Ekologo-geograficheskie zakonomernosti raspredeleniia geterotrofnykh bakterii v Atlanticheskome okeane], *Microbiologiya*, Mar.-Apr. 1970 39(2), p.362-371, In Russian with English summary. 11 refs.

Heterotrophic bacteria, assimilating unstable organic matter, were uniformly distributed in water of the Atlantic Ocean between the Greenland and the Antarctic (along 30W). The lowest content (0-9 bacteria per 40 ml water) was registered in the subarctic, southern subtropical and subantarctic zones. Waters of the equatorial-tropical zone contained relatively high concentration of heterotrophic bacteria: dozens and even over 100 bacteria per 40 ml water were found in 65% of all samples taken from this zone. Vertical distribution of heterotrophic bacteria along 60N-60S revealed alternation of water layers with high and low content of the bacteria. These layers, 7-11 from the ocean surface to the bottom, reflected stratification of waters of the equatorial-tropical and arctic-antarctic origin, respectively. Considerable similarity in the topography of waters layers of the equatorial-tropical and arctic-antarctic origin in 1959 and 1969 suggests relative stability of the structure of the Atlantic Ocean (along 30W) revealed by the method of microbiological indication. (Auth.)

B-44322

Capelli, R., Minganti, V., De Pellegrini, R., Fiorentino, F., **Mercury (total and organic) and selenium in Pagothenia bernacchii (Boulenger, 1902) from Terra Nova Bay (Antarctica). Results after two years of research, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.47-54, 4 refs.**

During the 1988-89 Italian expedition in Antarctica, specimens of the fish *Pagothenia bernacchii* were collected in Terra Nova Bay. Muscle and liver were considered and mercury (total and organic) and selenium were detected using atomic absorption spectrometry. Results obtained were compared to the data of the 1987-88 expedition. No evident differences seem to exist between the two samplings in total mercury (average 0.629 microgram/g dry weight) and organic mercury (average 71.4%) found in the muscle. Selenium average (2.58 microgram/g DW) is lower than that found in previous sampling (4.13 microgram/g DW). The mercury content in the liver is lower than in the muscle, with an average of total mercury of 0.331 microgram/g DW and with 49.8% organic mercury. (Auth.)

B-44339

Vernon, P., Vannier, G., **Ecophysiological adaptations of arctic and antarctic insects** [Adaptations ecophysiologiques des insectes arctiques et antarctiques], *Société d'ecophysiologie. Bulletin*, June 1990 15(1), p.7-21, In French with English summary. Refs. p.17-21.

Geographic and climatic differences between the Arctic and the Antarctic contribute to the understanding of observed differences between the composition of the northernmost and southernmost entomological communities. Arctic and antarctic insects must fit with low temperatures, strong winds and weak precipitations. Some species are freezing-susceptible: they are able to increase their supercooling ability thanks to cryoprotective solutes. Some species are freezing-tolerant: ice nucleating agents result in a low supercooling capacity and allow ice formation in the extracellular compartment. The pre-eminence of holometabolous insects over hemimetabolous insects in the Arctic and that of Collembola over Pterygota in the Antarctic may be explained with the help of ecophysiological and biogeographical data. (Auth.)

B-44344

Kim, D.Y., Kim, Y.O., **Tintinnina (Ciliophora: Oligotrichida) in the Marian Cove, King George Island, Korean journal of polar research**, Dec. 1990 1(2), p.1-10, 9 refs.

A taxonomic study on antarctic tintinnids was conducted based on the plankton samples collected from King George I. during Mar. 1988 through Jan. 1989. As a result, 8 species of tintinnids comprising 3 genera and 2 families were identified and described in the present study: *Codonellopsis balechi*, *C. gaussi*, *Laackmanniella naviculaefera*, *Cymatocylis brevicaudata*, *C. calyciformis*, *C. convallaria*, *C. drygalskii*, and *C. vanhoeffeni*. All of them are known to be endemic species of antarctic waters. (Auth.)

B-44347

Yang, J.S., Jeon, D.S., **Study for environmental impacts assessment on natural environment in the new construction area around the Korean antarctic station: (1st year)**, *Korean journal of polar research*, Dec. 1990 1(2), p.25-34, 4 refs.

As part of a construction project initiated in 1987-88, the King Sejong Station team will build a new power-plant and two hangars. The sites were bulldozed, and no additional destruction to lichens and bryophyte colonies is expected. Yellow-painted guard rails will guarantee the protection of the plants from traffic. While a major rookery is located 2 km away from the construction sites, no explosives or dynamite will be used during the construction, so no serious hazard to the marine mammals and birds is foreseen. All scientists and construction workers will be instructed not to destroy the natural environment unnecessarily during the construction. It is concluded that the impact on the environment will be minimal. Additionally, a summer research program for the environmental impact assessment due to the new construction work will be initiated in 1990-91 seasons, and will continue for more than 10 years. (Auth. mod.)

B-44362

Watanabe, K., **Sub-ice microalgal strands in the antarctic coastal fast ice near Syowa Station**, *Japanese journal of phycology*, Sep. 1988 36(3), p.221-229, With Japanese summary. 16 refs.

Sub-ice microalgal strands, collected in the fast ice area near Showa Station, are reported and described floristically. In mid-July, no strands were seen on the bottom of the ice. Strands 10-15 cm in length were observed hanging from the sea ice in early Nov. which grew up to 50-60 cm by early Dec. The strands were mainly pennate diatoms, especially those that form long colonies, including *Amphi-*

prora kufferathii, *Berkeleya rutilans*, *Nitzschia lecontei*, *Nitzschia stellata*, *Nitzschia turgiduloides*, and several species of *Nitzschia* in a section *Fragiraliopsis* with a small abundance of a solitary cell species of *Navicula glaciei*. Cluster analysis performed on samples collected from a 10 m long sweep with a net under the ice suggests that the seasonal succession of the organisms composing strands from Nov. to Dec. was not significant. (Auth.)

B-44363

Satoh, H., Watanabe, K., **Primary productivity in the fast ice area near Syowa Station, Antarctica, during spring and summer 1983/84**, *Oceanographical Society of Japan. Journal*, Dec. 1988 44(6), p.287-292, With Japanese summary. 23 refs.

In situ measurements of the primary productivity of ice algae and phytoplankton were carried out in the fast ice area near Showa Station during the austral spring and summer of 1983/84. Standing stock of ice algae reached a maximum of 45.1 mg chl *a*/sq m in late Oct. Phytoplankton standing stock attained a value of 3.57 mg chl *a*/sq m in mid-Jan. Primary production of ice algae in late Oct. (7.64 mgC/sq m/hr) was 14 times greater than that in mid-Jan. (0.54 mgC/sq m/hr). Production in the water column in mid-Jan. (3.46 mgC/sq m/hr) was 50 times greater than that in late Oct. (0.07 mgC/sq m/hr). These results indicate a substantial production by ice algae in the spring and by phytoplankton in the summer period. (Auth. mod.)

B-44386

Leckie, R.M., **Middle Cretaceous planktonic foraminifers of the antarctic margin: Hole 693A, ODP Leg 113**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.319-324, 25 refs.

DLC QE39.T49b

A planktonic foraminiferal fauna of probable late Aptian age is recorded in Cores 113-693A-47R and -48R, located on the antarctic continental margin. Moderate to highly productive surface waters and upper bathyal paleodepths are inferred from benthic and planktonic foraminifers, and other biotic and mineral components in the >63 microns size fraction. (Auth.)

B-44388

Ling, H.Y., Lazarus, D.B., **Cretaceous radiolaria from the Weddell Sea: Leg 113 of the Ocean Drilling Program**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.353-363, Refs. p.357-358.

DLC QE39.T49b

Unusually well-preserved Cretaceous radiolarians are observed in the subsurface sections from two drilled sites in the Weddell Sea collected during Leg 113 of the Ocean Drilling Program. Radiolarians from the lithified calcareous chalk of Hole 689B represent the first Campanian-Maestrichtian assemblage which is characterized by abundant *Cromyodruppa ?concentrica*, *Dictyomitra multicostata*, and *Protostichocapsa stocki*. Abundant *Pseudodictyomitra pentacolaensis* and *Diacanthocapsa* sp. 1, on the other hand, are the main constituents of the assemblage from the latest Aptian/earliest Albian diatomite of Hole 693B. These represent the oldest and the highest-latitude reported radiolarian occurrences from the Atlantic sector of the antarctic ocean. The assemblages are marked by their low diversity and an absence of low- to mid-latitude zonal indices. (Auth.)

B-44395

Karentz, D., Cleaver, J.E., Mitchell, D.L., **Cell survival characteristics and molecular responses of antarctic phytoplankton to ultraviolet-B radiation**, *Journal of phycology*, June 1991 27(3), p.326-341, 70 refs.

Twelve species of antarctic diatoms were studied to assess UV sensitivity in relation to cellular and molecular aspects of DNA damage and repair. Responses of cell survival, induction of DNA damage, and DNA repair capacity were determined. There was a wide range of interspecific UV-sensitivity among diatoms. Molecular analysis (by radioimmunoassay) of UV-induced DNA damage [induction of cys-syn cyclobutane dimers and pyrimidine (6-4) pyrimidone photoproducts] also revealed considerable variability among species. Comparison of cellular responses associated with photoenhanced repair and nucleotide excision ("dark") repair indicated that light-mediated correction of UV damage was an important factor in cell survival. There was a relationship between the number of photoproducts induced and cell survival, but not between repair efficiency and survival. Smaller cells with greater surface area: volume ratios were more sensitive to UV exposure. The wide species variations observed in molecular and cellular responses to UV exposure emphasize the ecological implications of changes in natural UV regimes. These changes can act as determinants of cell size and taxonomic structure within phytoplankton communities and have as yet unknown effects on trophic interactions within the antarctic ecosystem. (Auth. mod.)

B-44396

Lizotte, M.P., Sullivan, C.W., **Rates of photoadaptation in sea ice diatoms from McMurdo Sound, Antarctica**, *Journal of phycology*, June 1991 27(3), p.367-373, 42 refs.

Sea ice microalgae are released from their relatively stable light environment to the water column seasonally, and any subsequent growth in a vertically mixed water column may depend, in part, on their photoadaptation rates. In this study the time course of photoadaptation in natural sea ice algal communities was followed from bottom ice and surface ice by measuring their photophysiological response to an artificial shift in the ambient irradiance field. Microalgae from under-ice habitats were incubated under full sunlight LL-HL (low light to high light) and microalgae from surface ice habitats were incubated under artificial light to mimic under-ice irradiance HL-LL (high light to low light). During 3- to 4-day time course studies, opposite shifts in chlorophyll were observed, depending on the direction of the irradiance change. First-order rate constants (k) ranged from 0.0067 to 0.29/hr for photosynthetic parameters. Rates of photoadaptation for ice algae are comparable to k values reported for temperate phytoplankton, suggesting that sea ice algae may be equally capable of adapting to the light conditions experienced in a vertically mixed water column. This study presents the first evidence that sea ice microalgae are physiologically capable of adapting to a planktonic life and thus could serve as a seed population for polar marine phytoplankton blooms. (Auth. mod.)

B-44399

Tanimura, Y., Fukuchi, M., Watanabe, K., Moriwaki, K., **Diatoms in water column and sea ice in Lützow-Holm Bay, Antarctica, and their preservation in the underlying sediments**, Tokyo. National Science Museum. *Bulletin. Series C: Geology and paleontology (Kokuritsu kagaku hakubutsukan kenkyu hokoku)*, Mar. 1990 16(1), p.15-39, 55 refs.

Quantitative floral analyses have been performed on seawater and sea-ice samples collected from two sites near East Ongul I. in Lützow-Holm Bay. Fifty-nine diatom species and varieties belonging to 28 genera were identified in the samples. Nine species dominate the sea water assemblage: *Chaetoceros neglectum*, *Chaetoceros tortissimus*, *Fragilaria(?)* sp. a, *Nitzschia curta*, *Nitzschia cylindrus*, *Nitzschia le-*

cointei, *Nitzschia turgiduloides*, *Nitzschia vanheurckii* and *Porosira pseudodenticulata*. High abundance of the following 10 species characterize the sea-ice assemblage; *Berkeleya* sp. a, *Eucampia balaustium*, *Nitzschia closterium*, *Nitzschia curta*, *Nitzschia cylindrus*, *Nitzschia lecointeri*, *Nitzschia stellata*, *Nitzschia turgiduloides*, *Pinnularia quadratarea*, *Pleurosigma* sp. a, *Rhizosolenia alata* and *Tropidoneis* sp. a. Flora composition of the seawater and sea-ice samples are reflected in those of the underlying surface sediments of the bay, while diatoms with poorly silicified valves are less common in the sediment flora compared to the water column and/or sea-ice floras. Two important species associated with sea-ice and the underlying water, *N. curta* and *N. cylindrus*, occur commonly in the sediments after allowing for dissolution, and the predominance of these two forms may be a good indicator of the environment covered and/or strongly influenced by sea-ice. Other corrosion resistant ice forms, resting spore of *Eucampia balaustium* and *Pinnularia quadratarea*, have also been discriminated as supplementary guide taxa for near ice environment. (Auth.)

B-44401

Wharton, D.A., Brown, I.M., **Cold-tolerance mechanisms of the antarctic nematode *Panagrolaimus davidi***, *Journal of experimental biology*, 1991 Vol.155, p.629-641, 25 refs.

When free of surface water in air or liquid paraffin, the antarctic nematode *Panagrolaimus davidi* is freezing intolerant but avoids freezing by supercooling. Survival of long-term exposure is enhanced by sub-zero temperatures compared with controls maintained at 99% relative humidity and 15 C. In water the nematodes are seeded by exogenous ice nucleation and a proportion are freeze tolerant. Ice formation appears to be restricted to the pseudocoel. The degree of freeze tolerance is dependent upon the age of the culture and its thermal history. *P. davidi* is freeze tolerant when exposed to sub-zero temperatures in water, and freeze intolerant when free of surface water and able to supercool. These two strategies are not mutually exclusive, as they are often thought to be in arthropods. (Auth.)

B-44402

Burckle, L.H., Jacobs, S.S., McLaughlin, R.B., **Late austral spring diatom distribution between New Zealand and the Ross Ice Shelf, Antarctica: hydrographic and sediment correlations**, *Micropaleontology*, 1987 33(1), p.74-81, Refs. p.80-81.

Six diatom assemblages were identified in 10 surface water samples taken along a north-south track in Dec. 1976, between New Zealand and the Ross Ice Shelf. These were further divided into two groups, whose boundary is approximately marked by: the 0 C sea surface isotherm; a surface salinity minimum; the northward limit of high-silicate surface water; and the presence of sea-ice to the south. The northern group (two assemblages) is characterized by open ocean forms while the southern group (four assemblages) is characterized by ice-edge and near-ice forms. Diatom abundance along this track appears to be dictated by temperature and nutrients and the damping effects of sea-ice on surface water productivity. Other factors, such as differing nutrient concentrations and proportions and water column stability, are also considered. A number of surface water assemblages could also be observed in the underlying surface sediments after allowing for dissolution in the water column and the homogenizing effects of deep and bottom water currents. (Auth. mod.)

B-44403

Lin, H.X., Kleinschmidt, T., Braunitzer, G., Scheil, H.G., **Carnivora: the primary structure of Weddell seal (*Leptonychotes weddelli*, Pinnipedia) hemoglobin**, *Biological chemistry Hoppe-Seyler*, July 1989 370(7), p.707-713, 21 refs.

The hemoglobin of Weddell seal (*Leptonychotes weddelli*, Pinnipedia) comprises two components with identical beta-chains. The

alpha-chains differ in positions 15 (Gly/Asp) and 57 (Ala/Thr). The primary structure is presented of the chains which have been separated by reversed-phase high-performance liquid chromatography. The sequences have been determined by automatic Edman-degradation with the film-technique or the gas-phase method, using the native chains and the tryptic peptides of the oxidized chains. Compared to the corresponding human chains, 22 (23) substitutions were found in the alpha-chains and 14 in the beta-chains. In the alpha-chains exchanges involve one heme- and three alpha1/beta1-contacts. In the beta-chains one heme contact, one alpha1/beta1- and one alpha1/beta2-contacts are substituted. The sequences are compared to those of other Pinnipedia and Arctoidea hemoglobins. (Auth.)

B-44404

Millay, M.A., Taylor, T.N., Taylor, E.L., **Phi thickenings in fossil seed plants from Antarctica, *IWA Bulletin*, 1987 8(3), p.191-201, 18 refs.**

Primary anatomy and secondary development is described for two root types from the Fremouw Peak locality of early to middle Triassic age. Roots of *Antarcticycas* have a bilayered cortex with thick surface cuticle, diarch xylem, and a clearly defined endodermis surrounded by a single cell layer possessing phi thickenings. Secondary development begins with phellem and phelloderm production from the outer primary phloem position, and is followed by a bifacial vascular cambium next to the primary xylem that produces sieve cells and ray parenchyma to the outside. Young roots of *Antarcticoxylon* are similar to those of *Antarcticycas*, but may possess 2-3 cell layers with phi thickenings. Secondary development from a bifacial vascular cambium produces alternating bands of sieve cells and phloem parenchyma cells in the secondary phloem, and wood with uniseriate rays and scattered axial parenchyma. The presence of phi thickenings and an epidermal cuticle in both roots suggests environmental stress related to water regulation. The occurrence of phi thickenings in the roots of some conifers, angiosperms, a fossil cycad and a probable seed fern suggests this character is of ecological rather than phylogenetic significance. (Auth.)

B-44405

Maugeri, T.L., Bruni, V., Acosta Pomar, M.L.C., **On the characteristics of the microflora in the Terra Nova Bay waters (Antarctica), *Microbiologica*, 1991 14(1), p.55-64, 12 refs.**

Microbial studies on the marine Antarctic are still limited. These are the first results of the bio-oceanographic expedition (1987/88) that also carried out microbiological researches in the seawater of the Terra Nova Bay. Cellular densities were obtained by direct microscopic and cultural methods. The direct counts evaluate the "size fraction" of planktonic cells called "picoplankton" (all cells between 2 microns and 0.2 micron diameter). The cultural counts of aerobic heterotrophic bacteria were performed on Marine Agar 2216 (Difco) incubated at 4 C for 1-3 weeks. The effects of temperature on the growth and certain activities of the isolates were studied. The cellular densities and the genera of isolated bacteria are similar to those obtained in other seas. The percentage of unidentified strains is high (31.2%). The isolated bacteria are "psychrotolerant", according to Morita (1985). (Auth.)

B-44409

Satoh, H., Watanabe, K., Hoshiai, T., **Estimates of primary production by ice algae and phytoplankton in the coastal ice-covered area near Syowa Station, Antarctica, *Antarctic record*, Mar. 1991 35(1), p.30-38, Refs. p.37-38.**

Annual primary production of ice algae and phytoplankton under fast ice near Showa Station was estimated. Mean daily production from Feb. 1983 to Jan. 1984 was calculated with a mathematical model based on measured parameters of solar radiation, day length, attenuation coefficients of snow, ice and water, chlorophyll *a* standing stock, quantum yield for photosynthesis etc. Relative light intensity

estimated at the bottom of sea ice during the year ranged from 0 to 6.5% of incident solar radiation, due to attenuation by snow and ice. Maximum daily production of ice algae (34 mgC/sq m/d) and phytoplankton (450 mgC/sq m/d) was reached in Dec. and in Feb., respectively. The estimated annual production of ice algae and phytoplankton was 3.5 and 17 gC/sq m, respectively. These results indicate that summer phytoplankton production contributed remarkably to the primary production in the coastal ice-covered area near Showa Station. (Auth. mod.)

B-44419

Nicol, S., **CCAMLR and its approaches to management of the krill fishery, *Polar record*, July 1991 27(162), p.229-236, 20 refs.**

The Commission for the Conservation of Antarctic Marine Living Resources has met annually since 1982, with the task of implementing the Convention on the Conservation of Antarctic Marine Living Resources, the treaty which was designed to manage rationally the exploitation of resources in the southern ocean. The central resource of the region is antarctic krill (*Euphausia superba* Dana) and despite nine years of meetings the Commission has yet to adopt any conservation measures to protect krill. This article examines the published work of the Commission, seeking to determine how the Commission has dealt with the krill fishery and why it has not yet developed a krill management plan. (Auth.)

B-44420

Focardi, S., Gaggi, C., Chemello, G., Bacci, E., **Organochlorine residues in moss and lichen samples from two antarctic areas, *Polar record*, July 1991 27(162), p.241-244, 25 refs.**

Levels of some chlorinated hydrocarbon residues (HCB, HCH isomers, p,p'-DDT and related compounds, PBC congeners) in lichen and moss from Kay I., Ross Sea, are reported and compared with data from similar species collected on the Antarctic Peninsula. The role of the cold remote areas in the global circulation of these contaminants is briefly discussed. (Auth.)

B-44421

Townrow, K., Shaughnessy, P.D., **Fur seal skull from sealers' quarters at Sandy Bay, Macquarie Island, southern ocean, *Polar record*, July 1991 27(162), p.245-248, 12 refs.**

Fur seals were exterminated from Macquarie I. about 20 years after discovery of the island in 1810. Their specific identity is unknown. Few fur seals were reported at the island until it was occupied by the Australian National Antarctic Research Expeditions in 1948. Fur seal numbers are now increasing. An archaeological excavation at a sealers' quarters at Sandy Bay in 1988 revealed the fragmented skull of a young antarctic fur seal *Arctocephalus gazella* 1.1 m below the surface in a layer dated in the 1870s and 1880s. This period coincides with the recovery of fur seal populations in the South Atlantic Ocean following earlier harvesting. Elsewhere it has been argued that the antarctic fur seal is unlikely to have been the original fur seal at Macquarie I. because few individuals of that species are ashore in winter, which is the season when the island was discovered and fur-seal harvesting began. It is concluded that the Sandy Bay skull is from a vagrant animal. (Auth.)

B-44422

Hempel, G., **Life in the antarctic sea ice zone, *Polar record*, July 1991 27(162), p.249-254, 29 refs.**

Seasonal ice of the southern ocean, occupying some 15 million sq km, supports a distinctive biota based on algae that live on, within, and immediately beneath the ice floes. How this annually-forming habitat recruits its biota, and the fate of the biota after the ice thaws in late

summer, are little known. Studies in the Weddell Sea in 1984-88 have shown that the seasonal ice is important as the wintering substrate of krill *Euphausia superba* which, together with other zooplankton and fish, supports a large breeding population of seals and penguins. Clearly a key habitat in the economy of the southern ocean, this seasonal ice is likely to be vulnerable to small climatic changes. (Auth.)

B-44425

Sazhin, A.F., Kopylov, A.I., **Ecological role of bacteria in detritus and aggregates in the southwest Pacific Ocean** [Ekologicheskaya rol' bakterii na detrite i v agregatakh v vodakh iugo-zapadnoy chasti Tikhogo okeana], *Zhurnal obshchei biologii*, Sep.-Oct. 1989 50(5), p.682-692, In Russian with English summary. 24 refs.

The abundance of bacteria on detritus and aggregates changes significantly in the southwest of the Pacific Ocean on the border between antarctic, subantarctic, and subtropic waters. The share of associated bacteria increases from 1.4% total mass of bacterioplankton in the Antarctic to 3.6-4.6% in subantarctic and to 5.6% in subtropic waters. Maximal values of numbers and biomass of detrite-associated and aggregated bacteria are observed in border areas of different communities (10-30% total biomass). (Auth. mod.)

B-44426

Chikov, V.N., Mel'nikov, I.U.S., **On the question of fecundity of the Patagonian toothfish, *Dissostichus eleginoides*, in the region of the Kerguelen Islands**, *Journal of ichthyology*, 1990(Pub. June 1991) 30(8), p.122-125, Translated from Voprosy ikhtiologii. 9 refs.

The material for the present work was collected in Mar.-Apr. 1987 during the expeditions of the R/V *Skif* from bottom trawl catches. Fecundity was determined in 47 females with total lengths from 87 to 204 cm and weights from 6.7 to 95 kg, with ovaries at maturity stage III. The stages of maturity were determined visually, according to methods worked out for notothenioid fishes. Measurements and counts of oocytes were conducted on preserved material, for which ovary samples of 5-5.5 g were taken and preserved in 4% formalin. All the oocytes with diameters greater than 0.2 mm were measured. In Mar. and Apr. 1987, oocytes of other generations were measured, 31 fish in Mar. and 30 in Apr. Counts and measurements were conducted with the aid of an MBS-1 binocular microscope. For determination of the coefficient of maturation in more than 350 fish, total body weight and gonad weight were considered. The values of fecundity and its coefficients as a function of length and weight of females were computer calculated. (Auth.)

B-44427

Shandikov, G.A., Kratkii, V.E., **Capture of a second specimen of *Gvozdarus svetovidovi* (Nototheniidae) in the Sodruzhestvo Sea (East Antarctica)**, *Journal of ichthyology*, 1990(Pub. June 1991) 30(8), p.143-147, Translated from Voprosy ikhtiologii. 5 refs.

Immediately after being caught this specimen was determined to be the antarctic toothfish, *Dissostichus mawsoni*, and then a species of *Aetotaxis*. The specimen was identified as a new species, *Gvozdarus svetovidovi*, after review of the original description and direct comparison with the holotype. The main meristic and morphometric characteristics of the specimen compared to the holotype are presented in a table, and a brief description is given of those morphological features that add to the description of the species and genus and show variability of the characteristics. The most important additions concern the structure and topography of the trunk lateral lines. In the original description, *G. svetovidovi* is characterized by a single, very short dorsal (main) lateral line consisting of tubular scales. The existence of a second, median line, represented most likely by a series of freely sitting neuromasts, was assumed. In this second specimen, be-

sides dorsal and median lateral lines typical of nototheniids, there are two other sensory lines that are called the supradorsal and infraanal lines. (Auth. mod.)

B-44430

Bergmans, M., Dahms, Y.U., Schminke, H.K., **R-strategist in antarctic pack ice**, *Oecologia*, May 1991 86(3), p.305-309, 43 refs.

The antarctic copepod *Drescheriella glacialis*, an inhabitant of sea ice, is the first polar invertebrate metazoan to have been cultured throughout its life cycle. The authors describe its demographic characteristics on the basis of a laboratory cohort study and correlative field data. When compared to its closest temperate-zone relatives, *D. glacialis* shows temperature compensation of developmental and reproductive rates. A genuine *r*-strategist in every respect, it does not fit established trends for antarctic invertebrates but appears well adapted to the peculiar spatio-temporal variability of the sea ice habitat. (Auth.)

B-44434

Rauschert, M., **Faunistic investigations in the benthos of King George Island** [Ergebnisse der faunistischen Arbeiten im Benthos von King George Island (Südshetlandinseln, Antarktis)], *Berichte zur Polarforschung*, 1991 No.76, 75p., In German with English summary. Refs. p.43-48.

The studies are based on amphipod material collected during sublittoral investigations of the Fildes Peninsula—the southwestern part of King George I. The program included a SCUBA survey of the marine sublittoral, mainly carried out from boats and through holes in the fast ice, and additional collection using conventional gear. Turbulent tidal currents flow through the Fildes Strait with speeds of up to 5 knots. There is therefore a continuous lateral food advection. These conditions appear favorable for a greater number of species as compared to the adjacent lenitic Maxwell Bay. 103 amphipod species were found; 54 species were collected in Maxwell Bay and 84 species were found in the Fildes Strait; 65 species of amphipods are recorded for the first time in the area of the South Shetland Is. Two new genera and 13 new species have been described for the zone between 10 m and 60 m depth. They live in populations of low density in areas affected by the strong tidal currents in the Fildes Strait between King George and Nelson I. In this area the submarine topography is very irregular. It is hypothesized that the ecological conditions have promoted the evolution of many endemic species. (Auth. mod.)

B-44435

Klöser, H., **Distribution of microplankton organisms north and west of the Antarctic Peninsula according to changing ecological conditions in autumn** [Verteilung von Mikroplankton-Organismen nordwestlich der Antarktischen Halbinsel unter dem Einfluss sich ändernder Umweltbedingungen im Herbst], *Berichte zur Polarforschung*, 1990 No.77, 255p., In German with English summary. Refs. p.128-149.

This thesis describes the autumnal microplankton in the area north and west of the Antarctic Peninsula. Possible causes for the autumnal decline of phytoplankton and specific strategies of winter survival are discussed. Samples were taken during the Expedition ANT V/1 with the ice-breaking RV *Polarstern* in May and June, 1986. Some of the results are described. Biomass distribution, emphasizing chlorophyll *a* levels in the vicinities of the various islands, is discussed and the low values are explained by low irradiances combined with a mixing depth of 60 to 80 m. Individual species showed specific distribution patterns, most of which could be grouped into several basic patterns. Light climate, hydrography, sea ice influence, and grazing by zooplankton are considered relevant ecological factors. A cluster

analysis was performed with data on diatom counts. The obtained clusters agreed well with the hydrographic settings in the Weddell Sea, the Bellingshausen Sea, and Drake Passage. In the area of diatom enrichment in the course of sea ice formation, a mechanical enrichment process is lacking in the ice sheet and the presence of diatoms is due to settlement and growth, thus favoring the species with the largest initial population in the water column. In frazil ice a mechanical process is at work resulting in a dense concentration which favors the retention of bigger cells and washes out most of the smaller ones. (Auth. mod.)

B-44436

Kock, K.H., Kellermann, A., **Reproduction in antarctic notothenioid fish**, *Antarctic science*, June 1991 3(2), p.125-150, Refs. p.147-150.

Gonad maturation in antarctic notothenioid fish is a biennial process although spawning is likely to take place annually. However, part of the populations of *Champsocephalus gunnari* in the Atlantic Ocean sector do not spawn each year. Gonadosomatic index (GSI) of females is 15-40% at spawning. Apart from a few nototheniid species the GSI of males is much less, and typically only 15-20% of that of females. Spawning time is remarkably constant among populations of some species, in others a latitudinal shift in spawning time is apparent. Fecundity is commonly positively correlated with fish length and weight. It exceeds 100,000 eggs only in a few nototheniid species and is commonly in the order of 1000 to 15-20,000 eggs. Ova diameter varies from 0.8 to 5.0 mm. Egg size distribution among fishes of the seasonal pack-ice zone is bimodal. There is a general trend in nototheniids of increasing egg size and decreasing relative fecundity towards higher latitudes. Incubation time may be up to five months. Eggs of most species are probably left unattended for the long incubation period. Nest guarding has been observed in three species but may be more common in particular among the artedidraco-nids. A number of reproductive strategies associated with nest guarding, egg size and the duration of the pelagic phase have been identified. (Auth. mod.)

B-44437

Berkman, P.A., Waller, T.R., Alexander, S.P., **Unprotected larval development in the antarctic scallop *Adamussium colbecki* (Mollusca: Bivalvia: Pectinidae)**, *Antarctic science*, June 1991 3(2), p.151-157, Refs. p.156-157.

Most antarctic bivalves are small and protect their young by holding fertilized eggs or larvae in their mantle cavities for varying periods. Nourishment for these early growth stages is provided by yolk reserves rather than by planktotrophy. The anomalously large antarctic scallop, *Adamussium colbecki*, has unprotected planktotrophic larvae that are spawned during the austral spring. Successful recruitment of these larvae, in populations which are most abundant in oligotrophic habitats, may be associated with episodic pulses of organic material. Reasons why planktotrophy persists in *A. colbecki* are suggested by a comparison with another large antarctic bivalve, *Laternula elliptica*. The latter has protected lecithotrophic larvae that are released at the beginning of the austral winter. This comparison suggests that unprotected larval development persists in *A. colbecki* because of unusual anatomical and ecological adaptations among the adults of the *Adamussium* lineage that have been evolving in the southern ocean since the early Oligocene. (Auth.)

B-44438

De Broyer, C., Klages, M., **New *Epimeria* (Crustacea, Amphipoda, Paramphithoidae) from the Weddell Sea**, *Antarctic science*, June 1991 3(2), p.159-166, 14 refs.

Epimeria rubriques sp. n., belonging to the cold water family Paramphithoidae, occurred relatively often in Agassiz and bottom trawls taken during several German antarctic expeditions into the eastern Weddell Sea since 1983. Although this species is very con-

spicuous because of its long mid-dorsal teeth, bright pink-red color and large size (up to 70 mm), it has only been recorded in the Weddell Sea. The new species is compared to its closest relatives *Epimeria macrodonta* and *E. similis*, and an updated key to the 14 species of antarctic *Epimeria* is provided. Observations on the general and feeding behavior of living specimens of *Epimeria rubriques* sp. n. in aquaria showed the species to be an ambush predator and a weakly motile epibenthic walker, which swims only rarely. (Auth.)

B-44439

Hosie, G.W., **Distribution and abundance of euphausiid larvae in the Prydz Bay region, Antarctica**, *Antarctic science*, June 1991 3(2), p.167-180, Refs. p.178-180.

In Jan. 1985 a net sampling survey was carried out on the distribution and abundance of euphausiid larvae in the Prydz Bay region. *Euphausia superba* occurred in low abundance, probably due to sampling preceding the main spawning period. *Thysanoessa macrura* occurred throughout the study area in consistently high abundance. *Euphausia crystallorophias* was marginally more abundant within its restricted range. Distinct north-south variations in larval age and developmental stages of *T. macrura* were observed, indicating regional differences in spawning. *Euphausia frigida* was mainly confined to the upper 200 m of the Antarctic Circumpolar Current. *E. superba* larvae produced north of the shelf break, between 70-83E, moved in the East Wind drift. *E. crystallorophias* had the same westward dispersion, but some larvae appeared to return eastward via the Prydz Bay gyre and remain in the region. The data indicate that most *E. superba* larvae, providing they survive injurious cold temperature and food deprivation, will leave the area, suggesting that Prydz Bay krill may not be a self-maintaining stock. (Auth.)

B-44440

Ribic, C.A., Ainley, D.G., Fraser, W.R., **Habitat selection by marine mammals in the marginal ice zone**, *Antarctic science*, June 1991 3(2), p.181-186, Refs. p.185-186.

As part of the multi-disciplinary project, Antarctic Marine Ecosystem Research at the Ice Edge Zone (AMERIEZ), habitat selection by marine mammals was investigated within the marginal ice zone in relation to measured ice variables and other environmental factors. Data were collected on three cruises to the southern Scotia and northern Weddell Seas during spring 1983, autumn 1986, and winter 1988. During winter, antarctic fur seals were significantly associated with drift, pancake, brash ice, icebergs, and areas of uneven floe distribution, all characteristic of the marginal ice zone. Fur seals were seen in open water close to the ice edge during autumn, but during spring, as the pack ice began to retreat rapidly, animals were seen more often away from the ice. Minke whales were also associated with pancake and new ice but were seen further into the pack ice during both winter and autumn. The largest groups of minke whales during winter were observed with a large krill swarm in new ice. Crabeater seal was exclusively a species of the deep pack ice during all seasons, and was associated with ice cover of 7-8 oktas and evenly distributed ice floes. (Auth.)

B-44445

Hoshiai, T., ed, NIPR Symposium on Polar Biology, 12th, Tokyo, Dec. 6-8, 1989, **Proceedings of the NIPR Symposium on Polar Biology, No.4**, Tokyo, National Institute of Polar Research, 1991, 193p., Refs. passim. For selected papers see B-44446 through B-44456, B-44458, B-44459, I-44460 and J-44457.

This volume is a compilation of 17 full length papers and 7 abstracts, 15 of which are pertinent to Antarctica. The Symposium covered marine, freshwater and terrestrial biology, including the physiology of marine diatoms, krill, notothenioid fishes, and lichens; the ecological and climatic differences between continental and insular areas; the morphology of aquatic mosses; the characteristics of

water masses in the Ross Sea; vertical distribution of soil algae; and the microclimate of Yukidori Valley. The program of the Symposium and an author index conclude the volume.

B-44446

Katahira, R., Tominaga, H., Tominaga, N., **Effects of incubation temperature on distribution of C-14 in lipids in a psychrophilic marine diatom**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.9-16, 22 refs.

The incorporation of [^{14}C] bicarbonate into cells and the lipid fractions was determined at 6, 16 and 26 C using the psychrophilic marine diatom, *Navicula* sp. strain *D* grown at 3 C and 13 C. The intramolecular distribution of C-14 in both total lipids and three lipid classes (phospholipids, glycolipids and neutral lipids) was also estimated. The rates of C-14 incorporation into cells and the total lipid fraction were highest at 16 C, followed in order by those at 6 C and 16 C. The percentage of total incorporated C-14 present as total lipids was significantly low at 26 C compared with those at 6 C and 16 C. Among the three lipid classes, neutral lipids were predominantly labeled (50-80%) under the conditions employed. Relative radioactivity of total lipids localized in fatty acid methyl esters was significantly lower at 26 C than at 6 C and 16 C. This was attributable to a relative decrease of phospholipids and neutral lipids, the radioactivities of which were heavily presented in acyl moieties. These changes at 26 C were more marked with cells grown at 3 C than with those grown at 13 C. (Auth.)

B-44447

Spiridonov, V.A., **Investigations of moult cycles of the antarctic krill *Euphausia superba* Dana in concentrations in the D'Urville Sea (East Antarctic)**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.17-29, Refs. p.27-29.

The krill (*Euphausia superba*) collected with the commercial trawl in the D'Urville Sea in late Jan.-early Apr. 1989 was investigated for the moult stages, sex, length and maturity stages. *E. superba* aggregating in concentrations appeared to be characterized by the specific phases of the moult cycle. Most of the animals were intermoult or early premoult stages regardless of the sex and age. The premoult krill may leave the aggregations before ecdysis (probably as swarms with synchronous moulting). Thus, the moult processes should strongly influence the size and density of the concentrations. In autumn the moult frequency decreased, so the krill in concentrations were mostly in the intermoult phases. A slow moult rate is connected with an increase of the aggregation density, probably due to the decreased loss of the moulting krill or (and) moderation of the locomotor activity correlated with the moult state. (Auth. mod.)

B-44448

Ekau, W., Gutt, J., **Notothenioid fishes from the Weddell Sea and their habitat, observed by underwater photography and television**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.36-49, Refs. p.48-49.

About 3000 photographs and 21 hours of video were used to analyze and describe the habitat and some peculiarities of the behavior of notothenioid fish. In total, 987 specimens of more than 20 fish species were identified. The total area observed at 98 stations was estimated as 300 sq m for the photographs and 12,300 sq m for the video. The most abundant species were *Chionodraco myersi* with 192 and *Trematomus lepidorhinus* with 159 specimens observed. They are followed by *Trematomus scotti* (103), *Dolloidraco longedorsalis* (56), *Trematomus eulepidotus* (51) and *Prionodraco evansii* (41). Most of the species found are known to be demersal. But also benthopelagic species like *T. eulepidotus*, *C. myersi* or *Neopagetopsis ionah* (18) were found near or above the bottom. While the real de-

mersal fish (e.g. *Trematomus centronotus* or *Trematomus loennbergii*) were observed directly on the bottom within or on benthic organisms, the video pictures show that benthopelagic species such as *T. eulepidotus* or *N. ionah* swim some centimeters above the bottom. For some of the species a relation to the kind of substratum can be shown. Species composition depends on water depth and latitude. (Auth. mod.)

B-44449

Numanami, H., Okutani, T., **Lamellariid gastropods collected by Japanese Antarctic Research Expeditions from near Syowa Station and Breid Bay, Antarctica**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.50-68, Refs. p.65-67.

Among the benthos materials collected from near Showa Station, Breid Bay and G nnerus Bank, four species of the lamellariid gastropods were found. The descriptions of a new species *Marseniopsis syowaensis* n. sp., and two known species, *M. conica* and *M. mollis* are given. A single specimen considered to be a new species from Breid Bay is described. Some ecological bearings of the lamellariid gastropods in the Antarctic are discussed. (Auth.)

B-44450

Tsujino, Y., **Components of antarctic plants which inhibit seed germination**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.69-74, 5 refs.

The inhibitions of seed germination and microbe growth by extracts of antarctic plants were examined. Assays for non-specific toxin activity of the extracts were also carried out using soybean leaves. Three kinds of mosses, three kinds of lichens and five kinds of algae were extracted with methanol. The methanol extracts were evaporated, and the residues were extracted with chloroform. The chloroform layers and the aqueous layers were subjected to assays. Among them, chloroform extracts of two lichens inhibited seed germination and microbe growth. Purification of these extracts and structure elucidation of the active components are discussed. (Auth.)

B-44451

Nakamura, A., Inoue, M., **Analysis of isotopic ratio of iron in antarctic lichens, *Usnea sphacelata* and *Umbilicaria aprina***, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.82-90, 15 refs.

Isotopic distribution of iron was studied in two kinds of lichens, *Umbilicaria aprina* and *Usnea sphacelata* in the vicinity of Showa Station. Lichen samples were tentatively separated into two categorical sites, active growing site and inactive site. As the first attempt, the isotopic ratio of Fe-54 to Fe-58 incorporated in the lichens was determined by neutron activation method and partly by ICP mass technique. The isotopic ratios (Fe-54/Fe-58) of the active growing site were significantly smaller than those of the inactive site or substratum for both lichens. An autonomous incorporation of iron with a kinetic isotope effect by these lichens can be inferred. (Auth. mod.)

B-44452

Inoue, M., **Ecological notes on the differences in flora and habitat of lichens between the Syowa Station area in continental Antarctic and King George Island in maritime Antarctic**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.91-106, 25 refs.

A total of 57 species of lichens are identified near Showa Station and 198 species on King George I. Although most genera known to

occur in the Showa Station area are also found on King George I., only 20% of the species from Showa Station are also found on King George I. Most lichens from Showa Station are microlichens, whereas in the King George I. region many macrolichens are growing beside microlichens. The major factor controlling lichens in the Antarctic appears to be not temperature but water supply. In the Showa Station area extensive sites lack lichen cover, even where the ground is normally snow free in summer. On the other hand, both macro- and microlichens are growing everywhere in the King George I. region. Higher precipitation in that region than in the Showa Station area dilutes the salinity brought by the wind-blown sea spray. (Auth. mod.)

B-44453

Kanda, H., Ohtani, S., **Morphology of the aquatic mosses collected in Lake Yukidori, Langhovde, Antarctica**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.114-122, 17 refs.

JARE-29, 1987-1989, collected aquatic mosses growing in Lake Yukidori, near Showa Station. The moss specimens examined are mostly submerged forms of *Bryum pseudotriquetrum* (Hedw.) Gaertn., Meyer and Scherb. which is usually characterized by elongate stems, loose foliation and short-obtuse leaf-apices. The moss specimens occasionally included a submerged form of *Pottia heimii* (Hedw.) Hampe and were usually associated with some epiphytic algae. *Ceratodon purpureus* (Hedw.) Brid., which is one of the most abundant terrestrial moss species on the surrounding land, together with *B. pseudotriquetrum*, was not found in the lake. Ecological aspects of the lake in which aquatic mosses occurred are discussed. (Auth.)

B-44454

Ochi, H., Kanda, H., **New additions of bryaceous mosses (Musci, Bryaceae) to the antarctic flora**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.123-126, 5 refs.

Bryum pallescens Schleich. ex Schwaegr. is recognized for the first time from the Peninsular site, Antarctica, based on a collection made by a U.S. botanist. On examining three duplicates named *Bryum algens* Card. from East Antarctica, it has been revealed that at least one of them belongs to *Bryum pseudotriquetrum* (Hedw.) Gaertn., Meyer and Scherb., which is a new record for the region around the USSR base. (Auth. mod.)

B-44456

Utsugi, K., Ohyama, Y., **Antarctic Tardigrada II. Molodezhnaya and Mt. Riiser-Larsen areas**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.161-170, 13 refs.

A survey of tardigrades was attempted in two unexamined areas of Antarctica. Samples including algae or mosses were collected from 7 sites of Molodezhnaya Station and from 8 sites of Mt. Riiser-Larsen. Although 5 species, *Echiniscus kerguelensis*, *Macrobiotus harmsworthi coronatus*, *Hypsibius arcticus*, *Diphascon chilensis* and *Diphascon conjungens* were found in both areas, 3 species, *Macrobiotus montanus*, *Hypsibius antarcticus* and *Milnesium tardigradum* were found only at Molodezhnaya. *Isohypsibius saracenus* was found only at the foot of Mt. Riiser-Larsen. (Auth.)

B-44458

Yamamoto, H., Ohtani, S., Tatsuyama, K., Akiyama, M., **Preliminary report on cellulolytic activity in the antarctic region (extended abstract)**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.179-182, 9 refs.

In the present study, a preliminary investigation on cellulose decomposition by soil microorganisms was carried out at Showa Station and Langhovde Hills. The benchkote sheet method (Tatsuyama et al., 1984) was used for the estimation of cellulose decomposition in the soil. Five sites at Showa Station, three sites at a hut for biological research in Langhovde, and six sites in the Yukidori Valley were selected. Cellulose decomposition rates in soil at the respective sites are shown in tables. The decomposition rate observed at every site in the Yukidori Valley, the hut in Langhovde and at one site at Showa Station were only a few percent, while those at four sites near a urinal drum at Showa Station were significantly higher, 9 to 25%. (Auth. mod.)

B-44459

Akiyama, M., Ohtani, S., Kanda, H., **Vertical distribution of antarctic soil algae by direct observation with the contact slide method (extended abstract)**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.183-185, 10 refs.

The contact slide method designed by Colodny is known as a convenient method for direct counting of soil microbes under the condition *in situ*. In an attempt to obtain the details, particularly of vertical micro-distribution of algae, the contact slide method was tried in this study. Frosted slide glasses (ca. 76x26 mm) were set up in Jan. 1988 at three sites along a stream in the Yukidori Valley, and were collected in Jan. 1989. At each site, slide glasses were buried at a few meter intervals from the stream shore along a line set at a right angle to the stream. The occurrence of soil algae on the surface of each slide glass was recognized between the top portion of most of the slide glasses which corresponded to the soil surface and the lower portion of the slide glass which corresponded to the soil of 5 cm depth. Eleven taxa of Cyanophyceae, eight taxa of Chlorophyceae and four taxa of Bacillariophyceae were recognized. Among them, *Actinotaenium cucurbita* and *Pinnularia borealis* dominantly occurred on the surface of the slide glasses at all of the researched sites. The values obtained by the contact slide method are closely related to the values of chlorophyll content of soil which were derived mainly from epipsamic algae at the same site. (Auth. mod.)

B-44467

Wilson, R.P., Culik, B.M., Adelung, D., Spairani, H.J., Coria, N.R., **Depth utilisation by breeding Adélie penguins, *Pygoscelis adeliae*, at Esperanza Bay, Antarctica**, *Marine biology*, June 1991 109(2), p.181-189, 38 refs.

Miniature depth gauges were attached in Dec. 1987 and Jan. 1988 to Adélie penguins, *Pygoscelis adeliae*, breeding at Hope Bay. Results from 34 birds showed that foraging penguins with eggs and with brooded and crèching chicks spent mean periods away from the nest of 96, 36 and 21 h, respectively, during which time means of 29.0 h (30%), 11.2 h (31%) and 2.7 h (13%), respectively, were spent under water at depths > 5 m. Time under water was positively correlated with time absent from nest. Maximum depth reached was 170 m but overall birds spent most time at shallower depths. Birds foraging for brooded chicks dived deeper than birds foraging for crèching chicks. Stomach-pumping indicated that the principal prey caught at this time was krill, *Euphausia superba*. Mean mass changes of adults during single foraging trips indicated that krill were caught at a mean rate of 7.2 g/min spent under water. (Auth.)

B-44468

Johnston, I.A., Clarke, A., Ward, P., **Temperature and metabolic rate in sedentary fish from the Antarctic, North Sea and Indo-West Pacific Ocean**, *Marine biology*, June 1991 109(2), p.191-195, 31 refs.

Resting metabolic rate ($\dot{V}O_{2[\text{rest}]}$) was measured in demersal stages of the teleost *Notothenia neglecta* Nybelin from the South Orkney Is. from 1985 to 1987. The effects of activity on oxygen consumption was studied using a Brett respirometer. Adult stages had a factorial aerobic scope for activity ($\dot{V}O_{2[\text{max}]}:\dot{V}O_{2[\text{rest}]}$) of 5.7, which is similar to that reported for demersal fish from temperate latitudes. The effects of temperature on resting metabolism was investigated in fish with similar sedentary lifestyles from the North Sea and the Indo-West Pacific. The maximum metabolic rate of sedentary tropical species of 24 C is likely to be 2 to 4 times higher than in *N. neglecta* at 0 C. This suggests that the energy available for sustained activity ($\dot{V}O_{2[\text{max}]}-\dot{V}O_{2[\text{rest}]}$) is significantly lower in cold- than in warm-water fish. (Auth. mod.)

B-44484

Casey, R.E., Weinheimer, A.L., Nelson, C.O., **Cenozoic radiolarian evolution and zoogeography of the Pacific**, *Bulletin of marine science*, July 1990 47(1), p.221-232, 25 refs.

Modern day radiolarian distributions can be grossly divided into warm and cold water spheres separated by the polar convergences and the associated pycnocline. During the Paleogene both warm and cold water sphere radiolarian diversities appear to have been lower than during the Neogene. One major reason for this difference appears to be the difference in the number of water masses for radiolarians to inhabit during these times. The number of provinces increased in the Neogene due to the development of polar convergences and their associated polar, shallow subpolar and intermediate waters, the initiation of the formation of Antarctic (Polar) Bottom Water and associated Circumpolar Water, and the development of the surface Eastern Tropical Pacific as a specific water province. Specific examples of radiolarians evolving into these packages support these contentions. Another Neogene development was the creation of a new province that apparently resulted in the evolution, or expansion, of a new niche, that of the symbiont bearing radiolarians by a variety of taxa. This apparently was preceded by changes in antarctic geographies (and perhaps some biological influences) that resulted in antarctic glaciation and the development of this niche. (Auth.)

B-44512

McCartney, K., **Siliceous sponge spicules from Ocean Drilling Program Leg 113**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.963-970, 13 refs.

DLC QE39.T49b

Siliceous sponge spicules are present throughout many of the sections drilled by Ocean Drilling Program Leg 113. The assemblages consist mostly of monaxons and occur in Eocene to Pleistocene strata. Occurrences of the various spicule types are tabulated for Sites 689, 693, 694, 695, 696, and 697.

B-44526

Contreras, M., Cabrera, S., Montecino, V., Pizarro, G., **Abiotic dynamics of Lake Kitezh, Antarctica** [Dinámica abiótica del lago Kitish, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1991 No.41, p.9-32, In Spanish with English summary. 19 refs.

Lake Kitezh on Fildes Peninsula has an important anthropic influence because it is the source of drinking water for two antarctic

stations, Rodolfo Marsh and the Bellingshausen. Between Jan. 1984 and Oct. 1987, the thermal structure of the lake's water column was analyzed together with the ice cover characteristics, the amount of total incoming radiation and the proportion of photosynthetically active radiation at different water depths, nutrients, conductivity, pH, redox potential, and some meteorological data. An inverted temperature gradient is observed in winter, and the water generally registers higher temperatures than the air. The ice cover represents 20% of the lake's total water volume: 0.41 million cu m. The maximum depth of the lake is 9.8 m, with a mean of 4.58 m. In Jan. 1987, prior to melting, the ice cover showed several strata, the principal layer consisting of vertical ice columns which contained water bubbles enclosing living colonies of microalgae. During summer the water temperature generally rises to +4 C, but in 1984 it reached +6 C, which is attributed to the "El-Niño-Southern Oscillation". During 1987 the total maximum incoming radiation was 23 moles/ sq m/d, which is 67 times higher than the minimum in June-July. In summer only 35% of the total incoming radiation is photosynthetically active. The mean light extinction coefficient in the water was -0.235/m in 1985, and -0.301/m in 1987. Photosynthesizing organisms living at 1 m of depth can use 50% of Ph AR energy, decreasing with depth. The lake is susceptible to changes due to wind action, which causes strong currents to suspend fine matter, detritus or microalgae from the lake's bottom. Sodium and chloride ions showed the influence of sea water on the lake. (Auth. mod.)

B-44527

González, H., **Size-fractioned chlorophyll-a distribution in the Drake Passage and Bransfield Strait (Antarctica), during February 1990** [Distribución de clorofila-a fraccionada por tamaño de partículas en el paso Drake y en el estrecho Bransfield (Antártica), durante febrero de 1990], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1991 No.41, p.33-46, In Spanish with English summary. Refs. p.44-46.

At 13 oceanographic stations, water and net samples were collected in order to assess the spatial distribution (both horizontal and vertical) of the size fractioned photoautotrophic biomass. The biomass is expressed as chlorophyll-a, and information from the following size fractions is provided: <1.8; 1.8-10; 10-25; 25-40; 40-80; 80-150; 150-210; 210-335, and >335 microns. The results show a predominance of the smallest size fractions. The vertical distribution (1 and 50 m) of the autotrophic biomass of the nine size-fractions showed that only the <1.8 microns fraction (picoplankton) increased toward the bottom. Low values of total chlorophyll-a concentration (range 0.4 to 1.5 mg/cu m), were recorded for the South Shetland Is. area during the whole sampling period. Statistical analysis of chlorophyll-a data pooled in 3 groups (pico-, nano- and net plankton), showed significant differences in the independent variable station (biomass increase toward the SE) and the first-order interaction station x size-fraction (heterogeneous distribution of biomass as a function of station among the different size fractions). (Auth. mod.)

B-44528

Iriarte, J., **Preliminary study of the nano- and net-phytoplankton primary production in coastal waters of the South Shetland Islands, Antarctica** [Estudio preliminar de la producción primaria del nanoplancton y fitoplancton de red en aguas costeras de las islas Shetland del Sur, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1991 No.41, p.47-54, In Spanish with English summary. Refs. p.53-54.

Nanoplankton (<25 microns) and net-phytoplankton (>25 microns) primary production in the coastal waters was measured at 4 stations located in Chile Bay, Deception I., and Morton and McFarlane Straits, during Feb. 1990. The photosynthetic rates ranged from

0.10 to 2.22 mg C/cu m/h. The relative contribution of net-phytoplankton was higher (68%) than the nanoplankton fraction (32%) in relation to the total production. These differences are explained by the predominance of large diatoms in Chile Bay, Morton and McFarlane Strait, with the exception of Deception I. where *Pyramimonas* sp. (Prasinophyceae)—a small flagellate—were abundant. The reasons for the apparent discrepancy between the higher contribution of nanoplankton fraction to biomass (40-90%) than that as total primary production (32%) are discussed. (Auth. mod.)

B-44529

Llanos, A., **Abundance and bacterial secondary production in the South Shetland Islands area, Antarctica**

[Abundancia y producción secundaria bacteriana en el área de las islas Shetland del Sur, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1991 No.41, p.55-63, In Spanish with English summary. 26 refs.

During Feb. 1990, abundance and bacterial secondary production (BSP) measurements were carried out in the South Shetland Is. area. BSP values varied from 0.11 to 3.8 micrograms C/l/d. It is suggested that the main source of dissolved organic matter was from phytoplanktonic biomass because of the significant correlation between chlorophyll-*a* and BSP. Using gross primary production data available for the area, bacterioplanktonic carbon utilization would reach 7% to 25% ($X=10.5\%$) of this production. This suggests that heterotrophic free-bacteria constitute an important component in antarctic waters, similar to that in other pelagic ecosystems. (Auth. mod.)

B-44530

Wiencke, C., Stolpe, U., Lehmann, H., **Morphogenesis of the brown alga *Desmarestia antarctica* cultivated under seasonally fluctuating antarctic daylengths, Santiago de Chile. Instituto Antártico Chileno. Serie científica**, 1991 No.41, p.65-78, Refs. p.77-78.

The development of *Desmarestia antarctica* has been studied under daylengths mimicking the daylength conditions of King George I. Under June conditions the sporophytes were uniseriate. Primary laterals developed in July, secondary laterals were observed in Sep. Cortication of the main axis and primary laterals started in Oct. and Nov., respectively. Shedding of uncorticated parts was observed in the entire growth period of the sporophyte. In Feb. all uncorticated filaments were shed. The main axis of Oct-Nov. developmental stages consists of several layers of small outer cortical cells, larger inner cortical cells, into which smaller cells are interspersed, and the axial cell row. Cells of the axial filament show the characteristics of trumpet cells, which imply a transport function. Occlusions of their lumen apparent in sections of chemically fixed cells are artefacts since they were not found in cryofixed plants. The vegetative structure of the gametophytes varies depending on the light conditions. Gametogenesis was observed at temperatures of 5 C and below. (Auth. mod.)

B-44531

Piovano, M., **Studies on Chilean lichens. 16. Advances in the chemistry of secondary metabolites from antarctic lichens, Santiago de Chile. Instituto Antártico Chileno. Serie científica**, 1991 No.41, p.79-90, Refs. p.89-90.

The secondary metabolites of 12 species of antarctic lichens belonging to various systematical groups have been analyzed by macro-extraction. The compounds were characterized by their physical and spectroscopic properties. *Cladonia cornuta*, *C. lepidophora* and *Ochrolechia deceptionis* were analyzed for the first time. Atranorin and usnic acid were the most frequent lichen substances. The sterol ergosterol peroxide was isolated from all the species analyzed. (Auth.)

B-44532

Quilhot, W., **Quantitative variations of phenolic compounds related to thallus age in *Umbilicaria antarctica*, Santiago de Chile. Instituto Antártico Chileno. Serie científica**, 1991 No.41, p.91-97, Refs. p.96-97.

Densitometric analysis (HPTLC) was used to determine the concentrations of phenolic metabolites in thalli of different age in *Umbilicaria antarctica* Frey and Lab. Usnic acid and atranorin concentrations are highest in individuals of the youngest age class and decrease towards the oldest age classes, whereas gyrophoric acid is more abundant in intermediate age classes. Usnic acid and atranorin are present in isolated rhizines. The importance of the spatial distribution of atranorin and usnic acid in this species is discussed. (Auth.)

B-44533

Quilhot, W., **Temporal variation in usnic acid concentration in *Usnea aurantiaco-atra* (Jaq.) Bory, Santiago de Chile. Instituto Antártico Chileno. Serie científica**, 1991 No.41, p.99-106, Refs. p.105-106.

In *Usnea aurantiaco-atra* (Jaq.) Bory from Greenwich I., a monthly variation in the usnic acid content in individual thalli was studied by means of scanning densitometry (HPTLC). The higher accumulation rates were quantified from Jan. to May. There was a significant decrease in the concentrations from June to Dec., during three years of study. In spite of the thalli being collected at the same location, variations could be observed in the usnic acid concentration in individuals from within each monthly sample. (Auth. mod.)

B-44534

Czeczuga, B., Koch, P., **Investigations on carotenoids in lichens. 34. Differences in the carotenoid content in thalli of *Xanthoria candelaria* Arnold from Antarctica and Concepción, Chile [Investigaciones en carotenoides de líquenes. 34. Diferencias en el contenido de carotenoides en talos de *Xanthoria candelaria* Arnold, de la Antártica y de Concepción, Chile], Santiago de Chile. Instituto Antártico Chileno. Serie científica**, 1991 No.41, p.107-111, In Spanish with English summary. 21 refs.

The presence of carotenoids in the thalli of the lichen *Xanthoria candelaria* Arnold from two widely different ecological environments, Admiralty Bay, King George I., and Concepción, Chile, was investigated by column and thin-layer chromatography. The thalli from both environments differed in their carotenoid composition. The specimens from the Antarctic contain the carotenoids violaxanthin, neoxanthin and astaxanthin. Those from the mouth of the Biobio River contain the carotenoids zeaxanthin, lutein epoxide and antheraxanthin. The lichen thalli from both localities contain alpha-carotene, beta-carotene, beta-cryptoxanthin, lutein and mutatoxanthin. The thalli from the Antarctic were richer in mutatoxanthin than the thalli from Concepción. (Auth.)

B-44538

Rubinsky, B., Arav, A., Mattioli, M., Devries, A.L., **Effect of antifreeze glycopeptides on membrane potential changes at hypothermic temperatures, Biochemical and biophysical research communications**, Dec. 31, 1990 173(3), p.1369-1374, 14 refs.

The research on antifreeze glycopeptides (AFGPs) from antarctic and arctic fishes has focused primarily on their interaction with ice crystals. This study reports results of experiments in which pig oocytes, known to be sensitive to hypothermic temperatures, were exposed to 4 C for various periods of time, in solutions of different molecular weight AFGPs from antarctic nototheniid fishes. The membrane potential was measured across the oolemma following hypothermic exposure. The results show that a physiological combi-

nation of the different molecular weight AFGPs protects the structural integrity of the oolemma and inhibits ion leakage across the oolemma at hypothermic temperatures. The results also show that the hypothermic protection is nonlinearly dependent on concentration and that separately, the different molecular weight glycopeptides do not stop ion leakage even at very high concentration. The protection of membranes at hypothermic temperatures is a new property of AFGPs which was not known prior to the authors' work. (Auth.)

B-44539

James, S.R., Dobson, S.J., Franzmann, P.D., McMeekin, T.A., ***Halomonas meridiana*, a new species of extremely halotolerant bacteria isolated from antarctic saline lakes**, *Systematic and applied microbiology*, Aug. 1990 13(3), p.270-278, 27 refs.

DLC QR1.S94

Halomonas meridiana sp. nov., is proposed for seven strains of halotolerant, non-pigmented bacteria isolated from several hypersaline lakes of the Vestfold Hills. These strains, plus 17 new isolates of the antarctic species *Halomonas subglaciescola* and six reference strains of halotolerant bacteria, were tested for 134 physical and biochemical attributes. The data were analyzed by numerical taxonomic procedures. The new isolates clustered most closely with the reference strains *Halomonas elongata* (ATCC 33173T) and *Halomonas halmophila* (NCMB 1971T) and furthest from *H. subglaciescola* (UQM 2926T and UQM 2927), but were sufficiently distinct to be considered as a new species. The strains of *H. meridiana* separated into two phenons but representatives of both groups had DNA with 59 mol% G+C. (Auth.)

B-44543

Williams, R., McEldowney, A., **Guide to the fish otoliths from waters off the Australian Antarctic Territory, Heard and Macquarie Islands**, *Australian National Antarctic Research Expeditions. ANARE research notes*, June 1990 No.75, 173p., 61 refs.

Otoliths from 76 fish species are illustrated and described as an aid to the identification of stomach contents of antarctic birds and mammals. Material was obtained from waters off Australian Antarctic Territory and from around Macquarie and Heard Is. Information is also given on the distribution, habits and known predators of the fish species. (Auth.)

B-44544

Huntley, M.E., Lopez, M.D.G., Karl, D.M., **Top predators in the southern ocean: a major leak in the biological carbon pump**, *Science*, July 5, 1991 253(5015), p.64-66, 31 refs.

Primary productivity in the southern ocean is approximately 3.5 gigatons of carbon per year, which accounts for nearly 15% of the global total. The presence of high concentrations of nitrate in antarctic waters suggests that it might be possible to increase primary production significantly and thereby alleviate the net accumulation of atmospheric carbon dioxide. An analysis of the food web for these waters implies that the southern ocean may be remarkably inefficient as a carbon sink. This inefficiency is caused by the large flux of carbon respired to the atmosphere by air-breathing birds and mammals, dominant predators in the unusually simple food web of antarctic waters. These top predators may transfer into the atmosphere as much as 20 to 25% of photosynthetically fixed carbon. (Auth.)

B-44569

Boyd, I.L., Lunn, N.J., Barton, T., **Time budgets and foraging characteristics of lactating antarctic fur seals**, *Journal of animal ecology*, June 1991 60(2), p.577-592, 39 refs.

Time allocation to parental care ashore and foraging at sea by lactating antarctic fur seals at Bird I. during 1988-89 and 1989-90 is investigated, and this is related to foraging behavior measured in terms of diving performance at sea and growth of pups. The mean duration of foraging trips was 121 h and 100 h in 1988-89 and 1989-90, respectively, while periods ashore were 55 h and 45 h, respectively in the two years. There was a significant difference between these variables in the two years, but there was no significant difference in the percentage of time spent at sea. In both years, there was significant variation between individuals in the foraging-attendance time budget. There was a positive correlation between mean time spent ashore and mean time spent at sea for individual seals. The foraging-attendance patterns of seals changed significantly with time through lactation in one year of the study but not in the other. There was no effect of maternal age or size on foraging-attendance time budget. Duration of foraging trips or the period spent ashore had no effect on pup growth rate. During short foraging trips (1-2 d) seals dived for a greater proportion of the time available for foraging than during longer foraging trips. Seals fed predominantly on krill during both years. Most foraging occurred at night and this was reflected in diel variation in times of arrival and departure of seals from the pupping colony. Based on estimated swimming speed and travel times to and from Bird I., it was estimated that seals were normally feeding between 60 and 90 km from Bird I. (Auth.)

B-44570

Prasad, A.K.S.K., Fryxell, G.A., **Habit, frustule morphology and distribution of the antarctic marine benthic diatom *Entopyla australis* var. *gigantea* (Greville) Fricke (Entopylaceae)**, *British phycological journal*, June 1991 26(2), p.101-122, 85 refs.

The antarctic marine benthic diatom *Entopyla australis* var. *gigantea* (Grev.) Fricke was collected as an epiphyte on red algae at Anvers I. Cells of *E. australis* var. *gigantea* form ribbon-shaped colonies, and sibling cells are attached by means of mucilage extruded through the apical pore fields of concave valves. No interlocking marginal spines were found in this SEM study. The cingulum is composed of a series of many open bands with elaborations of ligulae (described as rudimentary septa in the literature) at the poles. Each band has a single row of slits at the advalvar margin of the pars interior. The heterovalvate frustule is flexed in girdle view. Valves have simple multiseriate striae arranged alternately on the two sides of the zigzag sternum, but pronounced marginal ridges are seen only in the convex valve. Concave valves have prominent apical pore fields, whereas the convex valves do not. Rimportulae present on both the valves follow the "one per pole" pattern, but differ in structure and orientation of slits on each valve. On the basis of material from Greville's original collection the lectotype (BM 10265) is designated in this study and identification of antarctic specimens is confirmed. *E. australis* var. *gigantea* appears to have continued from the late Oligocene-early Miocene to the present, with its possible center of distribution on the eastern Pacific coasts. (Auth.)

B-44571

Spiegler, D., Von Daniels, C.H., **Stratigraphic and taxonomic atlas of *Bolboforma* (Protohytes, Incertae sedis, Tertiary)**, *Journal of foraminiferal research*, Apr. 1991 21(2), p.126-158, 37 refs. (p.142-143).

Members of the genus *Bolboforma* are marine microfossils of generally spheroidal shape, whose tests are composed of monocrystalline low-magnesium calcite, and are believed to be derived from protohytic algae. Bolboformids have been studied primarily in sediments from the North Atlantic, the North Sea Basin, and southern high latitudes; they range in age from middle Eocene to early Pliocene. They have not been observed in Pleistocene to Recent sediments. The geographical distribution of the genus and the stratigraphic occurrence of 42 *Bolboforma* taxa are outlined herein. Thirteen biozones are defined. Bolboformids, as now known, are distributed mainly in

high latitudes. So far, occurrences in low latitudes are rare. These microfossils have considerable biostratigraphic value, mainly in high latitudes, where they supplement the standard zonations based on other microfossil groups. This paper includes monographic, uniform descriptions of all known *Bolboforma* taxa, 15 new species among them. (Auth. mod.)

B-44575

Gutt, J., **On the distribution and ecology of holothurians in the Weddell Sea (Antarctica), *Polar biology*, June 1991 11(3), p.145-155, Refs. p.154-155.**

Species composition and ecology of holothurians at 52 stations in the Weddell Sea are described. A total of 26,833 specimens, belonging to 32 species, 22 genera, 7 families and 5 orders were collected. Two distinct groups showing different distributions were identified by cluster analysis. In the first group, the majority of species belongs to the Aspidochirotacea and Elasipodida. They are adapted to soft bottoms and found at the base of the Antarctic Peninsula, in the Gould Bay area and in the Filchner Depression. The other group consists mainly of species belonging to the Dendrochirotida and individual representatives of the remaining orders. Substrates are sand, hard bottom and biogenic structures. This group maintains a higher species diversity, has a preference for shallower depths and has more species than the soft bottom group. A description of different spatial niches for several holothurians was possible using morphological features together with information obtained from underwater photographs. A comparison of the Weddell Sea species with those from East Antarctica and the area around the Antarctic Peninsula revealed close similarities for the depth range between 160 and 700 m. (Auth. mod.)

B-44576

Lancraft, T.M., Hopkins, T.L., Torres, J.J., Donnelly, J., **Oceanic micronektonic/macrozooplanktonic community structure and feeding in ice covered antarctic waters during the winter (AMERIEZ 1988), *Polar biology*, June 1991 11(3), p.157-167, Refs. p.166-167.**

Fifty-seven species of oceanic micronekton and macrozooplankton were collected under pack ice during the winter in the vicinity of the Weddell-Scotia Confluence. The majority of the 57 species did not vertically migrate and lived deeper during the winter than during the spring or fall. In the upper 1000 m the dominant species were, in order of decreasing biomass, *Euphausia superba*, the cnidarian *Atolla wyvillei*, the ctenophore *Beroe* sp., and the mesopelagic fish *Electrona antarctica*, *Bathylagus antarcticus* and *Gymnoscopelus braueri*. *Thysanoessa macrura* and *Salpa thompsoni* were biomass subdominants. The majority of the dominant species showed little seasonal differences in biomass. However, the biomass of gelatinous species varied considerably, with *A. wyvillei* and *Beroe* sp. being most abundant and *S. thompsoni* least abundant during the winter. Incidence of food in the stomachs in several important species was low, suggesting a low impact on their zooplankton prey. *Euphausia superba* and the three common mesopelagic fish had significantly lower stomach fullness ratings during the winter than during the fall, suggesting an overall decrease in feeding activity of dominant species during the winter. (Auth. mod.)

B-44577

Arntz, W.E., Gorny, M., **Shrimp (Decapoda, Natantia) occurrence and distribution in the eastern Weddell Sea, Antarctica, *Polar biology*, June 1991 11(3), p.169-177, Refs. p.176-177.**

Of 108 successful ground and Agassiz trawl catches, taken between 155 and 2031 m depth in the eastern Weddell Sea on board RV *Polarstern* in spring and summer of 1985-1989, only 19 hauls (16.5%) contained no shrimps. The others yielded large numbers of *Noto-*

crangon antarcticus, *Chorismus antarcticus*, and *Nematocarcinus lanceopes* as well as 20 *Lebbeus antarcticus* and 11 specimens of an *Eualus* species new to science. Eight *Pasiphaea scotiae* were caught in a pelagic krill trawl. Although yields of the three common shrimp species in some cases exceeded 20 kg per 0.5 h haul, shrimp stocks in the area cannot be considered to be of commercial significance. There was considerable variation in numbers, sex composition, occurrence at different depths, and size-frequency distributions. *C. antarcticus* and *N. antarcticus* grow to a larger size compared with individuals from the Antarctic Peninsula area. Length frequency distributions are skewed towards larger sizes at higher latitudes. In the eastern Weddell Sea larger specimens of the three common species live at greater depths than smaller individuals. Potential reasons for these differences are discussed. (Auth. mod.)

B-44578

Bathmann, U., Fischer, G., Müller, P.J., Gerdes, D., **Short-term variations in particulate matter sedimentation off Kapp Norvegia, Weddell Sea, Antarctica: relation to water mass advection, ice cover, plankton biomass and feeding activity, *Polar biology*, June 1991 11(3), p.185-195, Refs. p.194-195.**

A multi-cup sediment trap was deployed at 250 m in the shelf area off Kapp Norvegia, Weddell Sea (630 m water depth) to determine the relative importance of water mass advection, sea ice movement, phytoplankton biomass and plankton feeding. Short-term fluctuations in sedimentation were determined using a sampling frequency of 2.7 days over 54 days during Jan. and Feb. 1988. Three periods of enhanced sedimentation were associated with water mass exchange, settling of diatoms following break-up of ice cover and release of fecal matter by krill feeding on particulate matter derived from phytoplankton and ice algae. An initial sedimentation pulse was mainly due to sinking pelagic diatoms and krill fecal strings containing algae released from sea ice passing over the trap position. The delta C-13 composition of the sedimented organic carbon was about -24 per mill. The isotope ratio decreased sharply by about 5.5 per mill at the end of the first pulse, indicating the source of sinking matter becoming pelagic diatoms of the retreating ice-edge. At this time the diatom *Corethron criophilum* contributed a very high proportion of the organic flux. (Auth. mod.)

B-44579

Williams, T.D., Croxall, J.P., **Chick growth and survival in gentoo penguins (*Pygoscelis papua*): effect of hatching asynchrony and variation in food supply, *Polar biology*, June 1991 11(3), p.197-202, 35 refs.**

In the gentoo penguin, *Pygoscelis papua*, the effects were examined of intra-clutch egg size differences and hatching asynchrony on differential chick growth and survival (including post-fledging survival), in 5 years for which indices of food supply were available. An initial size hierarchy within broods at hatching was due to hatching asynchrony, not intra clutch egg size differences. In 1988 only (a 'poor' food year), the weight advantage gained by the first-hatched (A) chick persisted to the end of brooding (30 days), with more second-hatched (B) chicks dying. There was no difference between A- and B-chick weights at fledging (60 days) or in overall chick survival between synchronous and asynchronous broods in any year. Post-fledging survival (measured in one year) was not related to fledging weight or hatching order. These results provide only partial support for the hypothesis that gentoo penguins operate a brood reduction strategy to optimize chick survival in years of low food availability. It is suggested that hatching asynchrony in gentoo penguins may result from selection to keep the first egg warm as soon as it is laid, due to extreme low ambient temperatures. (Auth.)

B-44580

Ullrich, B., Storch, V., Marschall, H.P., **Microscopic anatomy, functional morphology, and ultrastructure of the stomach of *Euphausia superba* Dana (Crustacea, Euphausiacea)**, *Polar biology*, June 1991 11(3), p.203-211, Refs. p.210-211.

Microscopic anatomy, functional morphology, and ultrastructure of the stomach of the krill *Euphausia superba* Dana were investigated by means of serial sections, scanning and transmission electron microscopy, and video technique. A separation of the stomach into an anterior part, called cardia, and a posterior part, called pylorus, became evident. Protrusions of the stomach into the midgut form the third region, called the funnel. The interior of the cardia is dominated by the two lateralia, originating from the side walls of the stomach. At their undersurface, they bear the primary filter. It separates the dorsal food channel from the ventral filtration channel, which is divided into two channels by a ventro-median ridge, the anteromedianum. Within the pylorus, the inferolateralia act to seal the food channel from the filtration channel. In contrast to many other Malacostraca, the inferomedianum bears no secondary filter. During live observations, the stomach of *Euphausia superba* shows distinct pumping phases. (Auth. mod.)

B-44583

Turkiewicz, M., Galas, E., Kalinowska, H., **Collagenolytic serine proteinase from *Euphausia superba* Dana (antarctic krill)**, *Comparative biochemistry and physiology*, 1991 99B(2), p.359-371, Refs. p.370-371.

A new digestive serine proteinase from *E. superba* is characterized. The serine proteinase shows collagenolytic properties; it acts on collagens from Achilles tendon (type I and V) and reconstituted fibrils of calf skin collagen under conditions that do not denature the substrates. The enzyme exhibits strong chymotrypsin-like and lower trypsin-like activities. The pH-Optima of the proteinase in protein substrates hydrolysis (6.0-6.2) are lower than those of synthetic substrates cleavage. Four of nine cysteine residues present in the enzyme molecule possess free thiol-groups. Since the enzyme is inhibited by *p*-chloromercuribenzoate (*p*CMB), *N*-ethylmaleimide (NEM) and iodoacetic acid (IAA), the role of its thiol-groups is discussed. (Auth. mod.)

B-44585

Franklin, C.E., Davison, W., Carey, P.W., **Stress response of an antarctic teleost to an acute increase in temperature**, *Journal of thermal biology*, May 1991 16(3), p.173-177, Refs. p.176-177.

Changes in haematocrit, plasma osmolarity and chloride concentrations were monitored in the antarctic teleost *Pagothenia borchgrevinki* before and after exposure to a 10 C rise in water temperature (0-10 C) for 10 min. All the parameters monitored were elevated after exposure to the 10 C sea water. Haematocrit exhibited the largest rise, increasing from 19.7-40.9%. Despite haematocrit increasing by 100%, return to control levels occurred within 12 h. Plasma osmolarity and chloride concentrations took only 8 h to return to resting values. (Auth.)

B-44586

Koubbi, P., Ibanez, F., Duhamel, G., **Environmental influences on spatio-temporal oceanic distribution of ichthyoplankton around the Kerguelen Islands (Southern ocean)**, *Marine ecology progress series*, 1991 72(3), p.225-238, 26 refs.

Ichthyoplankton of the oceanic zone surrounding the Kerguelen Is. was studied. The results concerning both abundance and spatial distribution of fish eggs and larvae are discussed. Samples were collected during joint French-Soviet oceanographic cruises in summer,

autumn and winter 1987 and summer 1988. The presence of the Antarctic Polar Front allowed the authors to show latitudinal distribution of the ichthyoplankton. Topography played an important role in separating mesopelagic and demersal species. (Auth.)

B-44587

Abyzov, S.S., Biriuzova, V.I., Kostrikina, N.A., **Actinomycete from very ancient layers of the icesheet of central Antarctica**, *Microbiology*, Nov.-Dec. 1990 (Pub. May 1991) 59(6), p.768-773, Translated from *Mikrobiologiya*. 20 refs.

As a result of microbiological analyses of an ice core extracted from different layers of the icesheet of central Antarctica, a small content of microorganisms was found belonging to various taxonomic groups. From a layer of the icesheet with an age of about 47,000 years one strain of actinomycete was isolated, which was close to the species *Streptomyces calvus*. Prolonged existence in a state of deep anabiosis at constant low temperatures of the order of -55 C had practically no effect on the main cultural and cytological characters of the streptomyce. (Auth.)

B-44610

Verheyden, C., Jouventin, P., **Over-wintering strategies of the Lesser Sheathbill *Chionis minor* in an impoverished and insular environment**, *Oecologia*, Mar. 1991 86(1), p.132-139, Refs. p.138-139.

The Lesser Sheathbill *Chionis minor* is an opportunistic predator and scavenger that breeds on sub-antarctic islands during the summer season, when many other seabirds are present, especially penguins on which it is kleptoparasitic. It is a poor flyer and over-winters on its breeding grounds, where it faces a diminished food supply and low temperatures; its foraging behavior is plastic enough to respond to such a variable environment. Population movements, dietary changes and monthly weight gains were quantified during a 13-month period of observation. Mortality rates, calculated over a 19-year period of banding, appeared to be age dependent: they decrease, due to competition, from juveniles to subadults, adult non-breeders, and breeders. After the Crested Penguin colonies have been deserted, some adult sheathbills (mainly females) remained territorial, extending their territory size and diet while their partners moved to previously undefended zones in King Penguin colonies (permanent and large in the Crozet archipelago), where they competed for a winter territory and subsequently associated with another mate. After this winter mating, mobile sheathbills returned the following summer to their breeding territory and previous mate. (Auth. mod.)

B-44612

Ino, Y., **Field measurement of net photosynthesis of mosses at Langhovde, East Antarctica**, *Ecological research*, Aug. 1990 5(2), p.195-205, 29 refs.

Net photosynthesis and dark respiration (CO₂ flux) of antarctic mosses were measured at Langhovde, East Antarctica, from Jan. 9-17, 1988. Moss blocks were taken from communities in the Yukidori Valley at Langhovde. Each block was composed of *Ceratodon purpureus* and *Bryum pseudotriquetrum*, or *B. pseudotriquetrum*. The upper part of the block was used to measure net photosynthesis and dark respiration. The net photosynthesis of each sample was measured in the field for one or three days with two infrared CO₂ gas analyzers and an assimilation chamber. The relationships of net photosynthetic rate and dark respiration rate to the water content of the sample, the intensity of solar radiation and the moss temperature were estimated from the field data. The maximum rate of net photosynthesis was about 4 micro mol CO₂/sq m/sec at saturating radiation intensity and at optimum temperature, about 10 C. Environmental features of moss habitats in the Yukidori Valley are discussed in relation to these results. (Auth. mod.)

B-44621

El-Sayed, S.Z., ed, **Biological Investigation of Marine Antarctic Systems and Stocks. BIOMASS newsletter, Vol.13, No.1**, College Station, Texas A and M University, July 1991, 16p.

This issue presents the highlights of major results of the European *Polarstern* Study (EPOS) of 1988/89, devoted to antarctic marine ecology, discussed at the EPOS Symposium held in Bremerhaven on May 22-27, 1991. It includes an account of the location, structure and objectives of the Antarctic Long Term Ecological Research (LTER) program, which will focus on the pelagic marine ecosystem and the ecological processes that link the extent of annual pack ice to the biological dynamics of different trophic levels; a summary of the report on the BIOMASS Non-Acoustic Krill Data Workshop, which showed that net type could affect both the composition of length-frequency and maturity stage distribution; a brief account of the International Seminar on Antarctic Oceanography, held in Chile on Mar. 7-9, 1991, providing personal and institutional contacts for future cooperation in antarctic and subantarctic scientific campaigns; a summary of the results of the 5th Italian Expedition to the Ross Sea, 1989/90; news from the BIOMASS Data Centre; BIOMASS correspondents' report on recent antarctic research, miscellaneous news; book reviews; and a list of upcoming meetings.

B-44630

Beintema, A.J., **Penguins shed stomach linings**, *Nature*, Aug. 8, 1991 352(6335), p.480-481.

A member of the Dutch Antarctic Expedition, 1990-1991, reports a previously unreported activity of the chinstrap penguin. The chinstraps were regularly seen regurgitating their stomach linings en route to the sea for feeding. Two explanations seemed possible: the chinstraps were making stomach adjustments in preparation for feeding responsibilities; or they were ridding themselves of excess fluoride which they had ingested by eating antarctic krill. Neither of these explanations stood up under close scrutiny, so explanations are being sought elsewhere.

B-44631

Smith, W.O., Jr., **Importance of *Phaeocystis* blooms in the high-latitude ocean carbon cycle**, *Nature*, Aug. 8, 1991 352(6335), p.514-516, 29 refs.

The Greenland Sea is particularly important to the world ocean circulation, and potentially to carbon dioxide exchange between the ocean and atmosphere, because it is an area of surface convergence and deep-water formation. Previous investigations indicate that biological productivity is low in this area, especially in waters remote from the ice edge. During Apr. and early May 1989, however, a massive bloom of the colonial prymnesiophyte *Phaeocystis pouchetii* developed across much of the Greenland Sea. From measurements of the rate of removal of nitrate from surface waters, it was calculated that the average regional new production was about 40 g C/sq m during the 35-day period of the authors' observations. This rate of new production is approximately equal to that observed in other hyperproductive polar regions, such as the Bering Sea and the Bransfield Strait. Because *Phaeocystis* blooms seem to be frequent and widespread in polar oceans, these results suggest that the Greenland Sea may be a larger sink for atmospheric carbon dioxide than has been previously thought. (Auth.)

B-44632

Goerke, H., Emrich, R., Weber, K., Duchêne, J.C., **Concentrations and localizations of brominated metabolites in the genus *Thelepus* (Polychaeta: Terebellidae)**, *Comparative biochemistry and physiology*, 1991 99B(1), p.203-206, 14 refs.

Concentrations of six bromophenol-related compounds were determined in three species of *Thelepus* from coasts of the Kerguelen Is.,

Brittany, West Sweden and the Bransfield Strait. One compound, bis(3,5-dibromo-4-hydroxybenzyl)ether, has not been reported previously in *Thelepus*. The three species contained the same compounds in comparable concentrations. These were not related to animal wet wt. Total values ranged between 0.5 and 1.5 mg/g wet wt. Highest concentrations were found in the distal parts of worms, particularly in tentacles and in the end of the abdomen. Thelepin, an antimicrobial constituent, was detected in the distal parts only, and is suggested to be of antiseptic importance in wound healing in the body parts that protrude from the worms' tubes. (Auth.)

B-44634

Hindell, M.A., Burton, H.R., Slip, D.J., **Foraging areas of southern elephant seals, *Mirounga leonina*, as inferred from water temperature data**, *Australian journal of marine and freshwater research*, 1991 42(2), p.115-128, Refs. p.127-128.

Fourteen time-depth-temperature recorders were recovered from adult southern elephant seals (*Mirounga leonina*) returning to Macquarie I. to breed or moult. The resulting temperature/depth profiles indicated that all four males spent most of their time in waters lying over the Antarctic Continental Shelf, whereas only one of the ten females spent any time there. Five of the females foraged just off the Antarctic Continental Shelf, and the other five remained near the Antarctic Polar Front. (Auth.)

B-44636

Pan, C.X., Shimada, K., **Cold hardiness of four antarctic terrestrial mites in the active season at King George Island**, *Journal of insect physiology*, 1991 37(5), p.325-331, 12 refs.

The mean supercooling points of field specimens of *Rhagidia gerlachei* (Trouessart), *Stereotydeus villosus* (Trouessart), *Gamasellus racovitzai* (Trouessart) and *Nanorchestes gressitti* Strandtmann were -9.9, -10.7, -7.6 and -18.2 C, respectively. A comparison of the mean supercooling points and their frequency distribution among different microhabitat groups of the species were studied separately. Several microhabitat groups of *R. gerlachei* and *S. villosus* showed significant differences ($P < 0.05$) in the mean supercooling points, which were found during Feb., especially in *G. racovitzai*. Starvation for 2 wks slightly enhanced their cold hardiness. Survival of the animals under low temperatures was not only determined by their supercooling ability but was also greatly affected by the humidity of environment. (Auth. mod.)

B-44637

Feller, G., Thiry, M., Gerday, C., **Nucleotide sequence of the lipase gene *lip2* from the antarctic psychrotroph *Moraxella* TA144 and site-specific mutagenesis of the conserved serine and histidine residues**, *DNA and cell biology*, June 1991 10(5), p.381-388, Refs. p.387-388.

The *lip2* gene from the antarctic psychrotroph *Moraxella* TA144 was sequenced. The primary structure of the Lip2 preprotein deduced from the nucleotide sequence is composed of 433 amino acids with a predicted Mr of 47,222. This enzyme contains a Ser-centered consensus sequence and a conserved His-Gly dipeptide found in most lipase amino-terminal domains. These sequences are involved in the lipase active site conformation, since substitution of the conserved Ser or His residues by Ala and Gln, respectively, results in the loss of both lipase and esterase activities. Structural factors that would allow proper enzyme flexibility at low temperatures are discussed. It is suggested that only subtle changes in the primary structure of these psychrotrophic enzymes can account for their ability to catalyze lipolysis at temperatures close to 0 C. (Auth.)

B-44649

Makarov, R.R., Maslennikov, V.V., Men'shenina, L.L., **Frontal zones as ecological boundaries in antarctic waters** [Frontal'nye zony kak ekologicheskie granitsy v vodakh Antarktiki], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.99-125, In Russian with English summary. Refs. p.120-125.

The unevenness of the spatial phenology of the development of *Calanus propinquus*, *Calanoides acutus*, *Rhincalanus gigas* populations and euphausiid larvae is explored. These unevennesses correlate with more general specific features of the spatial composition of waters. Zooplankters develop in accordance with their own rhythms in each type of water, thus contrasts exist in zones of secondary fronts, being the ecological boundaries in pelagic waters of the Antarctic. Linked with waters of different modifications, particular plankton communities, each with its own biotope in the water circulation system of the Antarctic, have rather similar species composition but quite different developmental rhythms and level of secondary production. (Auth. mod.)

B-44650

Bondarenko, M.V., Polonskiĭ, V.E., **Distribution and seasonal plankton composition at a section along 10E in relation to hydrological conditions** [Raspredelenie i sezonnoe sostoianie planktona na razreze po 10 v.d. v sviazi s osobennostiami gidrologicheskikh uslovii], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.125-140, In Russian with English summary. 13 refs.

The distribution of plankton in a section along 10E was analyzed on the basis of data records from the 42nd expedition of R/V *Professor Zubov*. A sharp change in the qualitative composition of phytoplankton was registered at the crossing of the northern and southern frontal divisions of the Weddell Gyre. Waters of high latitudes as well as waters of the Antarctic Circumpolar Current were characterized by a relatively homogeneous phytoplankton composition. Phytoplankton bloom was observed in waters of the Weddell Gyre proper; the abundance of copepods was at its highest there. The state of stocks of abundant copepods at the section changed gradually. The most relevant variations in the age composition of copepods were traced close to the front between waters of the Weddell Gyre and the Antarctic Circumpolar Current. (Auth.)

B-44651

Makarov, R.R., Soliankin, E.V., **Abundant copepods and regional characteristics of their seasonal development in eastern Weddell Gyre** [Massovye formy kopepod i regional'nye osobennosti sezonnogo razvitiia ikh populiatsii v vostochnoi chasti krugovorota Ueddella], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.140-167, In Russian with English summary. Refs. p.165-167.

Essential characteristics of the state of mass copepod populations (abundance and age composition) are derived from total catches of plankton taken by a Yuday net in 0-200(100) m or 0-500 m layer at seven sections made in Feb. 1983 in the eastern area of the Weddell Gyre. The contrast in abundance of copepods between the north and the south of the area correlates with seasonal developmental stages of populations of each species. More or less intensive spawning of all 3 species (*Calanus propinquus*, *Calanoides acutus*, *Rhincalanus gigas*) occurs in the north. Regional relationships of species have distinct links with the distribution of antarctic water modifications as biotopes of plankton communities. At the same time, the fact of salps being found in great numbers over most of the area on the seasonal development of copepod populations is undoubtedly significant. Three plankton communities were distinguished, correlating in one way or another with typical water masses of the area. (Auth.)

B-44652

Men'shenina, L.L., Fedotov, A.S., **Euphausiid larvae in the Weddell Gyre system** [Lichinki evfauziid v sisteme krugovorota Ueddella], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.168-182, In Russian with English summary. Refs. 181-182.

The article explores the distribution of larvae of 5 euphausiids in the Atlantic sector of the Antarctic. It is shown that the greater part of *E. superba* range of distribution lies most probably in the Weddell Gyre. The greater part of the distribution range of 3 species (*F. macrura*, *F. frigida*, *E. triacantha*) lies in the waters of the Antarctic Circumpolar Current. Their drift to the waters of the Weddell Gyre may be sterile (*E. triacantha*) or unsterile (*F. macrura*). Species characterized by the unsterile drift to strange waters (*E. superba*, *F. macrura*) may take advantage of favorable trophic conditions of secondary fronts, where abundance of their larvae reaches its maximum. The distribution of *E. crystallophias* larvae is restricted to shelf waters. (Auth.)

B-44653

Latogurskiĭ, V.I., Maklygin, L.G., Fedotov, A.S., Makarov, R.R., Soliankin, E.V., **Distribution and features of *Euphausia superba* population structure in the Weddell Gyre and adjacent waters** [Raspredelenie i osobennosti populatsionnoĭ struktury *Euphausia superba* v oblasti krugovorota Ueddella i prilozhashchikh vod, Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.183-205, In Russian with English summary. Refs. p.201-205.

An analysis is presented of the distribution of krill in relation to water circulation of different scales and water distribution of different modifications. Krill aggregation areas are found to be changeable, the variability increasing along the northern periphery of the Weddell Gyre, from west to east. Three groups are identified within the krill population: the Weddell Sea, the Bellingshausen Sea and the coastal group. Best represented is the first group, inhabiting the Weddell Gyre proper, where the greater part of its range of distribution lies, most probably in the western area of the system. (Auth. mod.)

B-44654

Latogurskiĭ, V.I., **Growth and maturation of *Euphausia superba* Dana in the northern areas of distribution (South Georgia and Bouvet Islands)** [Rost i sozrevanie *Euphausia superba* Dana v severnykh raionakh areala (na primere raionov ostrova Iuzhnaia Georgiia i ostrova Buve)], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.206-216, In Russian with English summary. 17 refs.

The growth and maturation of *E. superba* from two areas lying nearly at the same latitude in the northern part of the distribution range are studied, and significant differences were found. The growth rate of *E. superba* off South Georgia is double that near Bouvet I., and the maturation occurs a month earlier. The differences are attributed to higher temperature and bioproductivity of waters near South Georgia than in the area of Bouvet I. It is believed that during the warm season, a krill second spawning peak occurs in Mar.-Apr. in both areas. (Auth. mod.)

B-44655

Efremenko, V.N., **Faunistic peculiarities and distribution of mesopelagic ichthyoplankton in the Weddell Gyre system** [Faunisticheskie osobennosti i raspredelenie ikhtioplanktona mezopelagicheskikh vidov v sisteme krugovorota Ueddella], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.217-225, In Russian with English summary. 12 refs.

Differences in the distribution and the ratio of early stages (eggs, prelarvae, larvae) of four mesopelagic fishes in the Weddell Sea and in the waters of the Antarctic Circumpolar Current are discussed. Never occurring in waters of the high latitude modification, *K. an-*

derssoni's eggs and larvae serve as a clear indicator of the Antarctic Circumpolar Current in this area. Early stages of other species (*E. antarctica*, *B. glacilis*, *N. coatsi*) are widely distributed. *E. antarctica*, as derived from the ratio of early stages, spawns predominantly in the Weddell Sea, the spawning starting later than in the waters of the Antarctic Circumpolar Current. (Auth. mod.)

B-44657

Brey, T., **Population dynamics of *Sterechnus antarcticus* (Echinodermata: Echinoidea) on the Weddell Sea shelf and slope, Antarctica, *Antarctic science*, Sep. 1991 3(3), p.251-256, Refs. p.255-256.**

Sterechnus antarcticus inhabits the shelf and the slope of the Weddell Sea and is the predominant echinoid between 450 and 1200 m. Growth lines visible in the half pyramids of the Aristotle's lantern were interpreted as annual growth marks. A Von Bertalanffy growth function was fitted to age-diameter data of 217 specimens. Based on 92 trawl samples, a representative size-frequency distribution of *S. antarcticus* was established. From the growth curve, the size-frequency sample and diameter-weight regressions, mortality and somatic productivity of *S. antarcticus* were calculated by a size-converted catch curve and the weight specific growth rate method. Gonadal productivity was estimated by an average value for reproductive output of cold water echinoderms. Mortality rate Z as well as somatic P/B ratio amounted to 0.07/sq m/y. Annual somatic production was estimated as 0.3 mg/sq m/y, and annual gonadal production as 0.25 mg/sq m/y between 100 and 1200 m (0.6 and 0.5 mg/sq m/y between 450 and 1200 m). (Auth.)

B-44658

Davey, M.C., Clarke, K.J., **Spatial distribution of microalgae on antarctic fellfield soils, *Antarctic science*, Sep. 1991 3(3), p.257-263, 42 refs.**

The horizontal and vertical distributions of cyanobacteria and algae on soil polygons on Signy I. were investigated. Soil chlorophyll concentrations increased from the center to the edge of the polygons. Similar distributions of the non-motile genera, such as *Pseudanabaena* and *Nostoc*, were observed, whereas the motile taxa, *Phormidium* and *Pinnularia*, were evenly distributed across the polygon. *Phormidium autumnale* was the most widespread taxon, and other Oscillatoriaceae were also important. Most of the algal biomass was concentrated near the surface of the soil, although chlorophyll degradation products were found to depths of up to 8 cm. Examination of the soil profile by fluorescence microscopy indicated that a large proportion of the microflora occurred in the zone 0-1 mm below the surface, and scanning electron microscopy confirmed that few algae occurred on the soil surface. It is suggested that this may be a desiccation-avoidance strategy. Vertical migration of the motile microalgae to the soil surface was not observed in the field, but could be induced in the laboratory in the presence of excess water. (Auth. mod.)

B-44659

Hawes, I., Brazier, P., **Freshwater stream ecosystems of James Ross Island, Antarctica, *Antarctic science*, Sep. 1991 3(3), p.265-271, 14 refs.**

The freshwater streams of James Ross I. share many of the features common to other antarctic streams. There is a diel variation in temperature and discharge, which follows the daily insolation cycle; catchments are barren; stream vegetation is predominantly algal, comprising mat-forming cyanobacteria and filamentous chlorophytes; and physical factors, particularly turbidity and bed stability are important in determining biomass and composition of algal assemblages. Nutrient concentrations vary from stream to stream and over a diel cycle, with minimum dissolved N in late afternoon. Biomass attained and photosynthetic and respiratory rates are also comparable to those recorded in other antarctic streams, with low productivity/biomass ratios in perennial assemblages. (Auth.)

B-44660

Kappen, L., Breuer, M., **Ecological and physiological investigations in continental antarctic cryptogams. II. Moisture relations and photosynthesis of lichens near Casey Station, Wilkes Land, Antarctic science**, Sep. 1991 3(3), p.273-278, 30 refs.

In the second of three field studies on the ecology and physiology of lichens on Clark Peninsula, photosynthetic activity due to natural and artificial soaking of lichen thalli was investigated. Gravimetric measurements were used to quantify water uptake by lichens in contact with snow or ice. Quantum flux density under a 15 cm thick layer of snow can reach light saturation for net photosynthesis of *Usnea sphacelata* at temperatures around 0 C. Measurements with a steady-state CO₂ diffusion porometer in the field reveal that in *Usnea antarctica*, *Umbilicaria decussata*, and *U. aprina*, the optimum water content for net photosynthesis was 75-115% d. wt. after the thalli were sprayed with water or submerged. The depression of net photosynthesis at super-optimal water content was strong in these species. In naturally soaked *U. sphacelata* this depression was less apparent. The water content resulting from contact with snow is frequently near the optimum for photosynthesis. In lichens of continental Antarctica it seems that super-optimal water contents are the exception rather than the rule. (Auth.)

B-44661

Miquel, J.C., **Distribution and abundance of post-larval krill (*Euphausia superba* Dana) near Prydz Bay in summer with reference to environmental conditions, Antarctic science**, Sep. 1991 3(3), p.279-292, Refs. p.291-292.

Data on the distribution, abundance and population structure of krill in the Prydz Bay area during Jan.-Feb. 1985 are considered in relation to hydrography and phytoplankton standing stocks. Stratified mean density and biomass estimated for the whole surveyed area from RMT-8 hauls were among the lowest recorded (3.3 individuals 100/cu m and 3.1 g 1000/cu m), confirming Prydz Bay as a low krill abundance area in the southern ocean. Age cohorts 1+ to 4+ were present, the size of the animals increased from south to north, and juveniles were mostly found in surface waters near the pack-ice. Adults were in an active reproduced phase: 98% of the females were mated and 35% were ready to spawn whereas 86% of the males carried spermatophores. Breeding was taking place in oceanic waters over deep zones with the spawning season limited to Jan.-Apr. Phytoplankton biomass was also very low in the area (mean of 29 mg Chl *a*/sq m in the upper 200 m) and current speeds low, never reaching 10 cm/s. Krill distribution was strongly related to water circulation pattern but not related to phytoplankton distribution. (Auth.)

B-44696

Márquez, M.E.I., **Krill (*Euphausia superba*) identification by electrophoretic methods. Disk electrophoresis in polyacrylamide gel [Identificación del krill antártico (*Euphausia superba*) mediante técnicas electroforéticas. Electroforesis de disco en gel de poliácridamida], Buenos Aires. Instituto Antártico Argentino. *Contribución*, 1991 No.391, 15p., In Spanish with English and French summaries. 16 refs.**

Proteinograms by disk electrophoresis in polyacrylamide gel (PAA) corresponding to muscular extracts of krill (*Euphausia superba*) were carried out. Intraspecific variations were not found in the electrophoretic profiles of the specimens analyzed. The relative mobilities of the different proteic fractions were determined and their quantitative evaluation was carried out, dosing the proteinograms by densitometry. The results obtained allow one to consider the application of the methodology used for the typification of the species with biochemical criterion, and also for its commercial use for species identification. (Auth.)

B-44697

Mariñelarena, A.J., **Bacteriology of potable water at Argentine antarctic stations** [Calidad bacteriológica del agua de consumo de las bases antárticas argentinas], Buenos Aires. Instituto Antártico Argentino. *Contribución*, 1991 No.397, 20p., In Spanish with English, French and German summaries. 12 refs.

Between Jan. and Mar. of 1987, a bacteriological control of water in the reserve tanks of some Argentine antarctic stations, as well as in the natural reservoirs from which it is obtained, was carried out. Although water (liquid, snow or ice) in the natural environment was generally of a very good quality, small streams show evidence of fecal contamination, probably of animal origin, in areas where no permanent human settlements exist. Most of the tanks in the stations showed some kind of contamination, generally of fecal origin. The possible causes are evaluated and recommendations to avoid or solve them are made. (Auth.)

B-44699

Márquez, M.E.I., **Application of electrophoretic analysis of muscular proteins to identification of the species *Micromesistius australis* (Polaca)** [Aplicación del análisis electroforético de las proteínas musculares para el estudio de identificación de la especie *Micromesistius australis* (Polaca)], Buenos Aires. Instituto Antártico Argentino. *Contribución*, 1989 No.378, 16p., In Spanish with English and French summaries. 13 refs.

Studies on the sarcoplasmic proteins of the species *Micromesistius australis* captured in subantarctic and antarctic waters have showed qualitative similarities among the samples analyzed. Having determined the different proteic fractions by disk electrophoresis in polyacrylamide gel, the author considers its application for the identification of this species with taxonomic purposes and those of commercial control. The respective electrophoretic mobilities were compared and the quantitative evaluation of the fractions was carried out, dosing the proteinograms by densitometry. (Auth.)

B-44700

Vodopivec, C., Leva, D., Curtosi, A., Mariñelarena, A., Altube, C., **Preliminary studies to estimate hydrocarbon degradation by antarctic marine bacterial flora** [Estudios preliminares para la estimación de la degradación de hidrocarburos por la flora bacteriana marina antártica], Buenos Aires. Instituto Antártico Argentino. *Contribución*, 1989 no.377, 23p., In Spanish with English, French and German summaries. 17 refs.

During summer 1986-1987, samples of surface seawater from Potter Cove were contaminated artificially with five hydrocarbons and incubated "in vitro" during 30 days. A parallel experiment was carried out supplementing samples with nutritive salts (phosphorus and nitrogen). The disappearance of hydrocarbons at different times was determined through gaseous chromatography, along with a measurable bacterial response. In all the cases a greater degradation of the samples without the additions of nutrients was observed. The possible existence of interferences that affected the experiment are discussed briefly. (Auth. mod.)

B-44701

Genest, E.A., **Convention on Conservation of Antarctic Seals and the Antarctic Treaty System** [La Convención para la Conservación de las Focas Antárticas y el Sistema del Tratado Antártico], Buenos Aires. Instituto Antártico Argentino. *Publicación*, 1991 No.21, 135p., In Spanish with English, German and French summaries.

An analysis is presented of the successive Consultative and SCAR meetings and of the scientific answers to the requested information related to the fulfilment of Article IX of the Antarctic Treaty dealing with the protection and conservation of natural resources in Antarctica; in this case, concerning antarctic seals. The full text of the Convention on Conservation of Antarctic Seals is appended.

B-44702

Speirs, E.A.H., Davis, L.S., **Discrimination by Adélie penguins, *Pygoscelis adeliae*, between the Loud Mutual Calls of mates, neighbours and strangers, *Animal behaviour*, 1991 41(6), p.937-944, 27 refs.**

Playback experiments were conducted during the incubation period to test the responses of 10 male and 14 female penguins to recordings of the Loud Mutual Calls of their mates, neighbors and strangers. Loud Mutual Calls are given at the nest-site by lone birds, towards an opponent or as part of a display with mate or offspring and are individually distinctive. Both males and females discriminated between the calls of their mates and strangers. This is the first time an ability to discriminate between the calls of neighbors and strangers has been demonstrated in a colonially breeding seabird. The greater fidelity of males than of females to nest-sites probably results in a more stable 'vocal environment' for males than for females. Males may thus have greater opportunities than females to learn the calls of their neighbors. (Auth.)

B-44703

Wilson, R.P., Culik, B., Spairani, H.J., Coria, N.R., Adelung, D., **Depth utilization by penguins and Gentoo penguin dive patterns, *Journal für ornithologie*, Jan. 1991 132(1), p.47-60, Refs. p.59-60.**

Time-at-depth data, recorded by animal-attached miniature depth gauges, were examined in 8 Gentoo penguins which showed two depth utilization patterns; decreasing time with increasing depth, which is interpreted as due to "bounce-diving" in the pelagic zone; and constant time per depth interval down to specific depths, where large time peaks were encountered, which is interpreted as "flat-bottomed" diving in benthic-foraging birds. Multiple maximum depth data reported in the literature for various penguin species were analyzed to reconstruct proportional time-at-depth. These results, together with real time-at-depth data, indicated that penguin depth utilization was strongly mass dependent, with larger species spending a greater proportion of time in deeper water. (Auth.)

B-44704

Stein, D.L., Meléndez C., R., Kong U., I., **Review of Chilean snailfishes (Liparididae, Scorpaeniformes) with descriptions of a new genus and three new species, *Copeia*, May 16, 1991 No.2, p.358-373, Refs. p.372-373.**

Liparidids constitute a speciose cottoid family that is distributed worldwide. Recent studies show that contrary to previous belief, many species occur on the west coast of South America and in the Antarctic. Liparidid material from the coast of Chile between the intertidal and the mid-depths of the continental slope includes four genera and 11 species. In this paper, the authors review the known material, describe a new genus and three new species, redescribe and discuss poorly known early material, diagnose the remaining species, and provide an inclusive key. (Auth. mod.)

B-44705

Crafford, J.E., Chown, S.L., **Comparative nutritional ecology of bryophyte and angiosperm feeders in a sub-Antarctic weevil species complex (Coleoptera: Curculionidae), *Ecological entomology*, Aug. 1991 16(3), p.323-329, 35 refs.**

Highly productive and structurally diverse angiosperm communities occur on Marion I., yet cryptogams are the main source of energy and nutrients for five of the six native weevil species (Curculionidae: Ectemnorhinini) that occur there. The consumption rate and approximate digestibility (AD) (mass and energy) of bryophytes and angiosperms in two *Dusmoecetes* species indigenous to Marion I. were compared. The approximate digestibility of *Blepharidophyllum densifolium* (Scapaniaceae) energy and dry mass were similar for *D. marioni* Jeannel adults at 5 C and at 10 C. *D. similis* (C.O. Waterhouse) adults fed *Azorella selago* Hook (Apiaceae) leaves also had similar AD for food dry mass and energy at 5 C and 10 C. However, the performance of *D. similis* on *A. selago* leaves and flowers at 5 C was better than that of *D. marioni* on bryophytes at both temperatures. Bryophyte feeding does not appear to be nutritionally more advantageous at low temperatures in the subantarctic, nor does angiosperm herbivory appear to be comparatively disadvantageous at low temperatures. It seems likely that moss-feeding evolved in response to an absence of angiosperms during glacial periods, rather than because of a nutritional advantage associated with bryophagy at low temperatures. (Auth. mod.)

B-44707

Davis, L.S., McCaffrey, F.T., **Recognition and parental investment in Adélie penguins, *Emu*, Sep. 1989 89(3), p.155-158, 26 refs.**

Discrimination abilities of Adélie penguins *Pygoscelis adeliae* were studied by cross-fostering eggs within two days of laying, chicks within five days of hatching, chicks 11-15 days of age and chicks 17-21 days of age. Results show that Adélie penguins have no innate mechanism for recognition of offspring. Discrimination by adults was apparent only after 17-21 days of post-hatching familiarity, which corresponded with the end of the guard stage. By contrast, chicks may have learnt to distinguish adults by 11-15 days of age. During the guard stage, within-brood food allocation by parents was determined by sibling competition. (Auth.)

B-44708

Adamson, E., Adamson, H., Vesk, M., Seppelt, R.D., **Morphological, ultrastructural and physiological characteristics of damage to an extensive stand of the lichen *Usnea sphacelata* at Casey Station, East Antarctica, *Linnean Society of New South Wales. Proceedings*, 1990 112(4), p.229-240, 15 refs.**

An extensive stand of the foliose lichen, *Usnea sphacelata*, in the immediate vicinity of the new Casey Station displays unusual symptoms of severe damage, the cause of which is unknown. This study provides a description of the damaged site, documents morphological and ultrastructural features of the damage, and compares the photosynthetic pigment composition and chlorophyll fluorescence characteristics of damaged and healthy specimens. Despite massive pruning of the foliose *Usnea* thallus and substantial bleaching of the remaining basal portions (around 80% chlorophyll and carotenoid loss), the results indicate that many of the damaged lichens contain viable algal cells. New shoots are plentiful among many of the remaining lichen stumps. It is suggested that the damaged areas described in this paper have the potential for substantial recovery. (Auth. mod.)

B-44757

Yang, H.F., McTaggart, A.R., Burton, H., **Relation between concentration of dissolved free amino acids and bloom of *Phaeocystis pouchetii* during summer in antarctic coast water, *Antarctic research*, 1990 2(4), p.45-49, In Chinese with English summary. 6 refs.**

Water samples were collected over a 9 month period beginning in May 1988, from 11 depths in an 80 m water column 10 km off shore from Davis Station. The samples were analyzed for Dissolved Free Amino Acids (DFAAs). The concentration of total DFAAs ranged

between 19 nmol/cu dm and 302 nmol/cu dm; with the highest value occurring on Nov. 23. In Dec., during the annual bloom of the prymnesiophyte alga *Phaeocystis pouchetii*, the concentrations of dimethyl sulfide and acrylic acid were rising, while the concentration of DFAAs was declining. It is suggested that the growth of *P. pouchetii*, either by direct uptake and/or indirectly by uptake from the associated quickly growing bacterial populations, reduced the DFAAs concentration. (Auth. mod.)

B-44765

Hewitt, R.P., Demer, D.A., **Krill abundance**, *Nature*, Sep. 26, 1991 353(6342), p.310, 6 refs.

A brief review is given of the need for an accurate measure of krill abundance as a prime tool in a krill management program. Acoustic methods and calculated values have consistently underestimated krill abundance by at least an order of magnitude. New measurements were obtained from experimentally constrained krill but had not been verified by field data. This report provides verification from data gathered around Elephant I. The results are compared with previously estimated data.

B-44788

Kerry, K.R., ed, Hempel, G., ed, **Antarctic ecosystems: ecological change and conservation**, Berlin, Springer-Verlag, 1990, 427p., Refs. passim. For individual papers see 46-584 through 46-599 or B-44789 through B-44834.

This volume is a collection of papers presented at the 5th Symposium on Antarctic Biology held in Hobart, Tasmania, Aug. 29-Sep. 3, 1988, concerning the short and long term changes in ecosystem and community structure caused by natural and human factors. The 45 papers which comprise this book are divided into the following areas of interest: long and medium term changes in the environment, seasonal changes in sea ice zones and off South Georgia, ecological and population changes in sea birds and mammals, actual and potential fisheries, and human impacts on terrestrial and marine systems. An article reviewing the Symposium, a general index and a genera and species index conclude the volume.

B-44790

Clarke, A., **Temperature and evolution: southern ocean cooling and the antarctic marine fauna**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.9-22, 49 refs.

Temperature can influence the physiology of marine organisms on a variety of time scales ranging from short-term fluctuations (tidal, vertical migration) to long-term climatic change. During the past 60 Ma shallow water marine organisms living at high southern latitudes around the margins of the continental fragments of Gondwana have experienced a decrease in mean seawater temperature from about 15 C in the early Tertiary to the present range of roughly +2 to -1.8 C. The early Cretaceous fauna around Gondwana was relatively rich and diverse. Despite the influence of glaciation the present fauna is rich in biomass and can show a very high within-site diversity. Some groups, however, notably fish and groups with calcareous skeletons such as bivalves and gastropods, are low in species richness. Evidence from physiology suggests that adaptation to low temperature is not a particularly severe evolutionary problem. It is proposed that, although a long-term change in mean temperature is often slow, this may be accompanied by severe short-term changes with which the fauna cannot cope; it is unlikely that temperature change alone causes widespread extinction, but rather temperature varying with other ecological factors. (Auth. mod.)

B-44791

Howard-Williams, C., Pridmore, R.D., Broady, P.A., Vincent, W.F., **Environmental and biological variability in the McMurdo Ice Shelf ecosystem**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.23-31, 25 refs.

The McMurdo Ice Shelf is an ablation region on the northwestern side of the Ross Ice Shelf. The surface forms the largest non-marine aquatic ecosystem in the McMurdo Sound region, with an interlinking system of lakes, pools and streams occurring across more than 1500 sq km. Two major types of ice shelf morphology with different physical and biological characteristics were distinguished: "Pinnacle Ice" with many small interconnected pools and streams, and "Undulating Ice" with continuous moraine cover and discrete pools and lakes. The flora of these is dominated by benthic rather than planktonic communities. Cyanobacteria which coat the base of the pools with mats and films of varying thickness are generally the most commonly occurring and abundant organisms. Benthic diatoms and coccoid chlorophytes are also found throughout the system. There are large variations in the conductivity and nutrient content of these waters, with a marine tidal influence in some parts. The water bodies are subject to continual change as the Ice Shelf moves, with marked temporal variability in environmental conditions on a diel, seasonal and long-term (years to decades) basis. This area contains the most extensive microbial growths in southern Victoria Land and is a potential inoculum source of micro-organisms for the entire region. (Auth.)

B-44792

Smith, R.I.L., **Signy Island as a paradigm of biological and environmental change in antarctic terrestrial ecosystems**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.32-50, 37 refs.

Examples of environmental, and consequently of biological, changes are presented for one climatically and ecologically sensitive locality, Signy I., to illustrate the diversity of changes which may affect the structure and dynamics of antarctic ecosystems in general. These are discussed in terms of ecological change resulting from long-term climatic trends, short-term climatic (especially summer temperature) fluctuations, plant colonization and growth, community development, and environmental perturbation. A plea is made for implementing long-term monitoring studies to determine the direction and rate of environmental and ecological changes, with particular regard to assessing the resilience of ecosystems to and their recovery from these phenomena. The antarctic environment offers probably the most significant baseline to which global atmospheric changes may be related. The predicted trend in global warming implies disturbing consequences for the future integrity of Antarctica's, and indeed the world's, environment and biota. However, it offers ideal opportunities to study the cause-and-effect relationship of ecological change and, from this, to develop a strong management policy for the active use and conservation of the antarctic biome. (Auth. mod.)

B-44793

Walton, D.W.H., **Colonization of terrestrial habitats—organisms, opportunities and occurrence**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.51-60, 56 refs.

The present antarctic and subantarctic flora and fauna should offer some valuable information on those groups of organisms which have successfully overcome the long-distance dispersal barrier and are adapted to colonization and establishment in a difficult environment. In addition, there is considerable potential for the experimental study of the process of colonization within these disjunct snow-free sites.

This chapter considers briefly the range of organisms already established and the evidence for both long-distance and local dispersal. Propagule characteristics are examined in relation to dispersal potential. The process of colonization is examined for lichens from data gathered from outside Antarctica to illustrate the potential for application to polar sites. A generalized model is proposed based on habitat favorability for the colonizing event, and its heterogeneity in time and space. The inadequacies of data for this model and primary colonization in general are noted and three major fields identified for future research. (Auth. mod.)

B-44794

Scott, J.J., **Changes in vegetation on Heard Island 1947-1987**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.61-76, 27 refs.

The Heard and McDonald Islands are the only subantarctic island group which appears to be free of human-introduced animals and plants. Vegetation changes in its species-poor flora are therefore likely to be due to natural factors. Significant glacial recession has exposed new areas for colonization over the past 40 years. Analysis of vegetation transect data from 7 glacier retreat zones and adjacent areas indicates 4 main patterns of primary colonization, with moisture availability and effects of animal disturbance being major differentiating environmental factors. It can be expected that with continuing climatic amelioration and glacial recession, the size of vegetated areas will expand. Changes in distribution of some vascular plant species around the island have been noted and tentatively linked with climatic warming, and additional changes are predicted. Future effects of changing trends in population numbers of animals utilizing and interacting with terrestrial vegetation communities are uncertain. Further changes can now be monitored from recently established reference points. (Auth. mod.)

B-44795

Ellis-Evans, J.C., **Evidence for change in the chemistry of maritime antarctic Heywood Lake**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.77-82, 19 refs.

Data collected at monthly intervals over the past 16 years from Heywood Lake reveal that, within a given year, physical, chemical and biological variables generally interacted predictably. The elephant seal population of the catchment has remained static over the entire period of study but fur seal numbers have been increasing steadily within the catchment over the past 10 years. A pronounced increase in peak winter concentrations of both dissolved reactive phosphate (DRP) and ammonium released from anoxic sediments is evident over the same period. A clear trend in recent years towards increasing summer open-water concentrations of ammonium-N indicates an influx of nutrients via surface runoff in addition to winter sediment release. This would also seem to be a consequence of the increasing fur seal presence in the catchment area. No evidence of increasing summer chlorophyll-*a* concentration was found, which conforms with the current hypothesis that light, rather than nutrient status, controls phytoplankton population dynamics in Heywood Lake during the open-water period. (Auth. mod.)

B-44796

Hawes, I., **Eutrophication and vegetation development in maritime antarctic lakes**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.83-90, 35 refs.

Differences in water chemistry and in the composition, abundance and activity of benthic and planktonic plant communities were observed in freshwater lakes of different trophic status at Signy I., maritime Antarctica. Phytoplankton density increased with increas-

ing nutrient concentration. Picoplankton (<2 microns) contributed most chlorophyll-*a* and numbers to the phytoplankton in all lakes, but the nanoplankton fraction (2-20 microns) was disproportionately active in photosynthesis. Some algae only occurred in the eutrophic lakes, notably a large *Chlamydomonas* sp., while smaller flagellated chlorophytes, chrysophytes and cryptophytes predominated in the nanoplankton of oligotrophic lakes. Partitioning of photosynthate in protein, polysaccharide, lipid and metabolite fractions showed little difference among the lakes. (Auth.)

B-44797

Oppenheim, D.R., **Preliminary study of benthic diatoms in contrasting lake environments**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.91-99, 44 refs.

Eleven of the 17 freshwater lakes from Signy I. were sampled by snorkel divers. A list of diatom taxa identified from benthic samples is presented. Most freshwater taxa listed were rare and only a few taxa were observed abundantly in many lakes. Assemblage composition varied among three broad lake categories: proglacial, oligotrophic, and mesotrophic lakes. Assemblage composition also changed with lake depth in the larger lakes. A second, more detailed study was undertaken on an oligotrophic and a mesotrophic lake. No seasonal trends could be identified. The limitation of the methods used are discussed, and spatial and temporal variability in antarctic lakes is considered. (Auth.)

B-44798

Smetacek, V., Scharek, R., Nöthig, E.M., **Seasonal and regional variation in the pelagial and its relationship to the life history cycle of krill**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.103-114, 95 refs.

In vast areas of the southern ocean, algal biomass is low but that of grazers comparatively high. It is argued that antarctic zooplankton, particularly the dominant copepods, are efficiently geared to the pelagic system overlying the deep ocean and maintain sizeable, stable stocks that undergo minor winter decline. The same is true for krill (*Euphausia superba*) but this animal is large enough to exploit the antarctic pelagial in a unique way. It retreats to the ice undersurface during the long winter and feeds with high efficiency on plankton concentrations following ice melt. Apparently, krill has geared its life cycle to oceanic circulation patterns, including that of the ice, in a way that maximizes seasonal and regional exploitation of food resources. Adaptation to the rugged ice undersurface is probably the most important factor enabling maintenance of a uniquely large monospecific stock of planktivores in a low productive ocean. The concept of ice as a hostile habitat must be revised; rather than posing a problem for survival, it provides the answer to the age-old riddle of high animal biomass in an icy environment. (Auth. mod.)

B-44799

Knox, G.A., **Primary production and consumption in McMurdo Sound, Antarctica**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.115-128, 76 refs.

This chapter provides a first synthesis of the data on primary production and consumption by invertebrate consumers in McMurdo Sound. The McMurdo Sound environment is briefly described, covering aspects such as bathymetry, sea ice development and breakout, and the hydrological regime. Based on available information, an interpretation of the circulation patterns within the Sound and beneath the McMurdo Ice Shelf is given. A simple model of primary production and consumption is presented and the annual production cycle is

discussed. The impacts of perturbations, such as variations in the timing and extent of the sea ice breakout, the depth of snow cover on the sea ice, and changes in the current systems under the influence of external driving forces are briefly discussed. The main points to emerge are: the McMurdo Sound primary production is high when compared with that of the open southern ocean, but it is comparable to that of the ice edge zone; the important contribution made to primary production by the annual *Phaeocystis* bloom; the major contribution which is made by the benthic microalgae in shallow inshore waters, a contribution that has been largely ignored in studies to date; the high degree of natural variability within the system; the potential for change in the various environmental variables that influence the system; and the deficiencies in the database and the need for integrated year-round studies of primary production and consumption. (Auth. mod.)

B-44800

Spindler, M., Dieckmann, G.S., Lange, M.A., **Seasonal and geographic variations in sea ice community structure of the Weddell Sea, Antarctica**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.129-135, 37 refs.

Seasonal and spatial variation in sea ice organisms were studied in the Weddell Sea region during summer 1985 and winter and spring 1986. Sea ice cores were collected from 22 stations. Winter values for chlorophyll *a* measured per 10 cm segment of drilled ice core ranged between 0 and 49 micrograms/l (mean 3.4) during July-Sep. and between 0 and 450 micrograms/l (mean 7.6) during Oct.-Dec., while mean summer values were considerably higher (mean 34.5) with a maximum of 2220 micrograms/l. Increasing numbers of sea ice organisms were also observed in sea ice cores in spring. Samples taken later in the season (Nov. compared to Oct.) revealed a higher biomass and more organisms. Algal biomass and absolute numbers of sea ice organisms, including foraminifers, copepods and ciliates, decreased along a transect from the ice edge towards the continent and along the eastern Weddell Sea coast from northeast to southwest. (Auth. mod.)

B-44801

Watanabe, K., Satoh, H., Hoshiai, T., **Seasonal variation in ice algal assemblages in the fast ice near Syowa Station in 1983/84**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.136-142, 21 refs.

Ice algal assemblages in the fast ice near Showa Station were investigated from Mar. 1983 to Jan. 1984. Peaks in the standing crop (chlorophyll *a*) occurred in Apr.-June and Oct.-Nov.; the largest occurred in mid-Nov. at a site with moderate snow cover. Chlorophyll was most highly concentrated in the bottom of the ice, where the diatoms *Amphiprora kufferathii*, *Berkeleya rutilans*, *Nitzschia lecontei*, *N. stellata*, *N. turgiduloides* and *Pleurosigma directum* were dominant. The chlorophyll concentration within the ice developed mainly in May, with little change during the following months at heavily snow covered sites. It increased in the upper consolidated snow layer during Oct.-Jan. The dominant species, *Tropidoneis* sp., was a minor component of the interior and bottom ice layers. Results suggest that the interior ice algal assemblage was formed by mechanical inclusion of microalgae at the time of sea ice formation, and did not grow in the ice. However, the bottom assemblage grew when irradiance was high enough. The surface assemblage, which was presumed to be inoculated by an interior assemblage through vertical channels, grew in spring. (Auth. mod.)

B-44802

Matsuda, O., Ishikawa, S., Kawaguchi, K., **Seasonal variation of particulate organic matter under the antarctic fast ice and its importance to benthic life**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.143-148, 12 refs.

Qualitative and quantitative analyses were carried out on organic matter in suspended particulate matter of seawater for a period of 1 year under the fast ice in Lützow-Holm Bay during 1984/85. Marked seasonal variation of suspended organic matter, in particular chlorophyll *a*, was observed. The concentration of suspended organic matter was generally high in summer and low in winter. The maximum value of chlorophyll *a* standing stock through the water column was 25 mg/sq m and the minimum was 0.4 mg/sq m. Maximum standing stock of particulate organic carbon was 9076 mg/sq m and the minimum was 1632 mg/sq m. However, the magnitude of the variation was low compared with the downward flux of particulate organic matter already reported for the same station. Suspended particles were rich in fresh algae and nutrients only during summer due to proliferation of phytoplankton and ice algae. (Auth. mod.)

B-44803

Hubold, G., **Seasonal patterns of ichthyoplankton distribution and abundance in the southern Weddell Sea**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.149-158, 25 refs.

The distribution and abundance of fish larvae were analyzed in early spring (Oct.-Nov. 1986) and summer (Jan.-Feb. 1985) during two cruises of the RV *Polarstern* to the southern Weddell Sea. In Oct. mostly post-larval and juvenile notothenioids were collected. A few larval specimens were represented by *Muraenolepis microps* and *Macrourus* sp. Larvae of *Pleuragramma antarcticum* and two channichthyids hatched near Vestkapp by mid Nov. In Jan., post-larval *P. antarcticum* dominated the ichthyoplankton (98% by numbers). The abundance of this species decreased by a factor of 5 between Jan. and Feb., while its distribution extended far beyond the continental shelf. Other notothenioids and oceanic *Electrona* sp. and *Notolepis* sp. appeared later in the season, and were equally abundant in both months. Of a total of 23 ichthyoplankton species, no more than 16 occurred together in each month. (Auth. mod.)

B-44804

Atkinson, A., Peck, J.M., **Distribution of zooplankton in relation to the South Georgia shelf in summer and winter**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.159-165, 20 refs.

Zooplankton was sampled with RMT (1+8) nets on a grid of stations surrounding South Georgia in early summer, 1981/82 and in winter, 1983. This chapter compares the summer and winter distributions of zooplankton in the shelf and oceanic portions of the survey area. During both summer and winter, mesopelagic species and salps were rare over the shelf. Neritic species were present at both times of year. In winter, the species which undergo seasonal vertical migrations tended to occur in greater abundance over the shelf than in the oceanic surface layer. This was thought to be due to the shelf having prevented the descent of these animals in the preceding autumn. These distribution patterns all suggest a relatively slow interchange of plankton between the oceanic and shelf systems, which may cause relict distributions of species over the South Georgia shelf. (Auth.)

B-44805

Kooyman, G.L., Mullins, J.L., **Ross Sea emperor penguin breeding populations estimated by aerial photography**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.169-176, 14 refs.

In Dec. 1983 aerial photographs of all emperor penguin breeding colonies along the Ross Sea coast from Cape Roget south to Beaufort I. were taken for the purpose of censusing this species. Cape Crozier, the most southerly colony, was counted from the ground. Chicks and adults could not be distinguished in the photographs. They were differentiated by using chick:adult ratios of 7 chicks to 1 adult (+/- 2.14 standard deviation, n=11) obtained from ground counts on Dec. 12-14, 1986, at Cape Washington. Of the six colonies, the smallest was Cape Crozier (78 chicks) and the largest was Coulman I. (estimated 22,137 chicks). Except for Cape Crozier and Beaufort I., for which the most recent published censuses were in 1977, the other colonies had not been counted since their first and last census in 1968 or earlier. There are differences between some of the earlier and the 1983 censuses. The estimated total of breeding birds in 1983 was about 120,000. A common characteristic of all colonies within the Ross Sea is their proximity to open water. (Auth.)

B-44806

Culik, B., Adelung, D., Woakes, A.J., **Effect of disturbance on the heart rate and behaviour of Adélie penguins (*Pygoscelis adeliae*) during the breeding season**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.177-182, 26 refs.

The behavior and heart rate of nine incubating Adélie penguins (*Pygoscelis adeliae*) and one chick at crèche age were recorded in a breeding colony at Esperanza Station during natural activity and disturbance. In adults, minimal heart rate at rest was 86 bpm (beats per minute), rising to a maximum of 127 bpm when the birds were standing. Heart rates reflecting the degree of disturbance rose from resting levels to 110, 118, 127 and 145 when the stimulus was sheathbill, congener, human and helicopter, respectively. In the chick, normal heart rates were higher by 140 bpm than in adults (2.2 kg as opposed to 4.5 kg). Heart rates during natural activity ranged from 220 (sleep) to 287 bpm (food run). Disturbance resulted in heart rate increasing from resting levels to 240 (congener), 260 (approaching helicopter), 273 (helicopter overhead) to 310 bpm (capture by a human). It is suggested that wild Adélie penguins, although often seemingly unconcerned, react strongly to man-made stimuli during the breeding season, which results in reduced fledging and hatching success. (Auth. mod.)

B-44807

Wilson, K.J., Taylor, R.H., Barton, K.J., **Impact of man on Adélie penguins at Cape Hallett, Antarctica**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.183-190, 20 refs.

The joint US-NZ base at Cape Hallett was established in Dec. 1956 on a stony spit occupied by breeding Adélie penguins (*Pygoscelis adeliae*). Over the 16 years the base was occupied it expanded to cover 4.4 ha, roads were constructed, habitat modified and scientific studies conducted. The colony declined from 62,900 pairs by 1959 to 37,000 pairs in 1968, then may have increased to 50,000 pairs in 1972. The colony was censused annually since 1981 and ground observations were made in 1983. These show that, while the population has increased to about its original size (over 66,000 pairs in 1987), few areas modified by man have been fully recolonized. During construction roads and the station environs were bulldozed flat, thus destroying the mounds on which the penguins nested. Even in the

absence of people such areas were recolonized only where mounds remained, or where they were constructed when the base was demolished between 1984 and 1988. (Auth. mod.)

B-44808

Trivelpiece, W.Z., **Adélie and chinstrap penguins: their potential as monitors of the southern ocean marine ecosystem**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.191-202, 13 refs.

Analysis of annual variability in the parameters recommended by CCAMLR for ecosystem monitoring revealed considerable variation among the parameters for which there is sufficient data to make an assessment. Interpretation of the observed variability was greatly enhanced when several parameters were considered simultaneously. In concert, the parameters should be useful for assessing perturbations in the antarctic ecosystem. The choice of Adélie and chinstrap penguins as key indicator species seems an excellent one, given their very different responses to the highly variable conditions in the Antarctic Peninsula region, their species-specific breeding patterns, and the asynchrony between their respective breeding seasons. If a time series of data becomes available, it may be possible to differentiate between fishery-induced and natural perturbations in the ecosystem. (Auth.)

B-44809

Davis, L.S., Miller, G.D., **Foraging patterns of Adélie penguins during the incubation period**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.203-207, 18 refs.

The duration of foraging trips taken by Adélie penguins *Pygoscelis adeliae* during the incubation period at Cape Bird, Ross I. was studied. In years when birds foraged longest, males apparently adjusted the duration of the Second Foraging Trip relative to the time available until hatching. In seasons where the sum of the first two foraging trips was well short of the incubation period, males showed no evidence of adjustment; however, females taking the Third Foraging Trip did. Cues for adjustment of foraging trips were not derived from eggs. Neither did the physiological condition (i.e. time spent fasting before foraging) of the birds affect the duration of foraging trips. It seems that time until chicks hatch is the crucial determinant of time spent foraging. If this is so, and food is not limiting, then attempts to relate foraging trip times to krill stocks may be ill-founded. (Auth.)

B-44810

Jouventin, P., Weimerskirch, H., **Long term changes in seabird and seal populations in the southern ocean**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.208-213, 25 refs.

This chapter reports on trends in the breeding populations of selected species at Dumont d'Urville and at Crozet, Amsterdam and Kerguelen Is. Populations of 12 seabird and 3 seal species are reviewed and analyzed. While most of the penguin and fur seal populations are today increasing, several populations of albatrosses and petrels and elephant seals are dangerously declining. Most of the changes reported here are considered to have been induced by past and present human activities. The importance of monitoring and demographic studies of birds and seals for managing and protection the living resources of the southern ocean is stressed. (Auth.)

B-44811

Whitehead, M.D., Johnstone, G.W., Burton, H.R., **Annual fluctuations in productivity and breeding success of Adélie penguins and fulmarine petrels in Prydz Bay, East Antarctica**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.214-223, 38 refs.

Annual chick productivity and breeding success, recorded at four Adélie penguin, *Pygoscelis adeliae*, colonies at Magnetic I. in eastern Prydz Bay, are presented for the seven breeding seasons 1981/82 to 1987/88. The adult breeding population remained relatively stable during the first 4 years of the study, and increased in the last 2 years. Substantial annual variation in breeding success occurred over the study period. Annual patterns of chick productivity in southern fulmar, *Fulmarus glacialis*, and antarctic petrel, *Thalassoica antarctica*, populations within Prydz Bay were synchronous with those of Adélie penguins. In the years of highest and lowest reproductive performance, prey abundance within the likely foraging areas was correspondingly high and low. Reproductive performance was greatest in years when fast-ice breakout occurred before the end of Dec. and lowest when breakout was after, and pack-ice cover persisted within the foraging range of the birds during the chick-rearing period. (Auth.)

B-44812

Hemmings, A.D., **Human impacts and ecological constraints on skuas**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.224-230, 38 refs.

Skuas are amongst the most-studied animals in the antarctic and subantarctic regions. This report documents human impacts across the range of natural environments occupied by skuas in the southern ocean. Increases in their populations are shown in response to station garbage, introduction of exotic prey species and as a result of human perturbations of the marine environment. Population reductions are being effected by direct destruction, the exclusion of birds from breeding grounds as a result of construction, agriculture or other human activity, or indirectly through reductions in local prey availability. These gross effects are compounded by the isolated nature of many of the ecosystems, which may recover only slowly or stabilize in different forms altogether. (Auth.)

B-44813

Young, E.C., **Long term stability and human impact in antarctic skuas and Adélie penguins**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.231-236, 9 refs.

This chapter assesses the impact of human activity associated with a field station on the long-term population stability of Adélie penguins (*Pygoscelis adeliae*) and antarctic skuas (*Catharacta maccormicki*) at the Northern Colony, Cape Bird, Ross I. The field station has been occupied over 22 years at this site. Human impact was assessed by comparing an area of the colony near the station with a second one at a distance which was much less disturbed. Skuas appeared largely unaffected by the station, with breeding density and pattern of territories little changed from first years of research here. The stability recorded in the skuas contrasts with the local impact found on the breeding penguins. Breeding groups nearest the station declined in numbers even though the total population of the colony markedly increased. (Auth. mod.)

B-44814

Croxall, J.P., Pickering, S.P.C., Rothery, P., **Influence of the increasing fur seal population on wandering albatrosses *Diomedea exulans* breeding on Bird Island, South Georgia**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.237-240, 12 refs.

Since 1961, the wandering albatross breeding population at Bird I. has decreased by 22% (1% per annum). Since 1960 antarctic fur seals at South Georgia have increased by 17% per annum; Bird I. was the main focus of this increase. The potential adverse effect of fur seals on wandering albatrosses was investigated by comparing breeding numbers, success and other aspects of population dynamics in areas with different abundances (including absence) of seals. Albatross breeding numbers have decreased more rapidly in areas with most seals. In contrast, albatross breeding success has increased over the last decade and is highest in areas with most seals. There is no evidence that seals have any adverse effect on established breeding albatrosses, but juvenile recruits to the breeding population tend to avoid areas with abundant seals. (Auth. mod.)

B-44815

Vergani, D.F., Stanganelli, Z.B., **Fluctuations in breeding populations of elephant seals *Mirounga leonina* at Stranger Point, King George Island 1980-1988**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.241-245, 21 refs.

This chapter presents data on annual fluctuations of the population of elephant seals at Stranger Point between 1980-1988 (excluding 1981). A maximum of 825 breeding cows was recorded in 1980. A decline in the population was observed in 1980-1982 which was followed by annual increments until 1986. A further decrease was observed in 1987. The female component was mainly affected in 1980-1982 ($r = -0.575$) while the male component was affected in 1987 ($r = -0.463$). A possible influence of El Niño Southern Oscillation (ENSO) events upon the numerical changes in the studied population is discussed. (Auth.)

B-44816

Testa, J.W., **Simulation of the age structure of crabeater seals in a fluctuating environment**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.246-252, 9 refs.

A population model of crabeater seals was constructed to assess the sensitivity of the age structure of crabeater seals to environmental fluctuations. The model incorporates density dependence in age-specific reproductive and survival schedules, with reproduction and juvenile survival being most sensitive to changing population size or carrying capacity. Environmental fluctuations were simulated by varying the population's carrying capacity in four ways: random fluctuations; random walk; sinusoidal oscillations with minor stochastic variation; and recurrent episodes of good years with variable periodicity. These simulations indicate that fluctuations in the environment for crabeater seals can be transmitted to the age structure, although some "noise" is inherent in the age structure signals. (Auth. mod.)

B-44817

Erickson, A.W., Hanson, M.B., **Continental estimates and population trends of antarctic ice seals**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.253-264, 36 refs.

Seal census data accrued during 1968-1983 were incorporated into a standard data format and revised density estimates were cal-

culated. A key element in this reanalysis was time correction of the census counts to peak diurnal haul-out values, using recently revised and evaluated correction equations. Comparison of the corrected census data on crabeater seals taken in the western Weddell Sea in 1968-69 and in 1983, and in the Pacific Ocean sector (90-160E) in 1973-74 and in 1983, showed declines in population density values. The causes of these lower density estimates of crabeater seals in the Weddell Sea [from 11.38 seals per square nautical mile in 1968-69 to 4.28 in 1983] and in the Pacific Ocean sector (from 4.93 seals per square nautical mile in 1973-74 to 1.95 seals in 1983) are unknown. There is no evidence of an acute die-off of crabeater seals, which suggests that the population declines, if real, have occurred over several years and may be food related. They may have resulted from increasing competition for food as the stocks of baleen whales recovered. (Auth. mod.)

B-44818

Bengtson, J.L., Ferm, L.M., Härkönen, T.J., Stewart, B.S., **Abundance of antarctic fur seals in the South Shetland Islands, Antarctica, during the 1986/87 austral summer**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.265-270, 20 refs.

A survey of antarctic fur seals (*Arctocephalus gazella*) in the South Shetland Is. during the 1986/87 summer indicated that this species is continuing its population recovery and recolonization of rookery sites following 19th century commercial exploitation. Eleven fur seal pupping sites were identified, some of which had not previously been reported. The largest pupping sites were at Telmo I. and Cape Shirreff, Livingston I., and at the Seal Is., Elephant I. Total fur seal pup production in the South Shetland Is. in 1986/87 was estimated to be approximately 4000 individuals. (Auth.)

B-44819

Bryden, M.M., Kirkwood, G.P., Slade, R.W., **Humpback whales, Area V. An increase in numbers off Australia's east coast**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.271-277, 17 refs.

Surveys of migrating humpback whales have been conducted off Australia's east coast since 1981 in an attempt to estimate the status of the Area V stock, which formerly was heavily exploited. Observations were made between 0700 and 1700 h for up to 84 days around the peak of northward migration, May to Aug. The estimated total numbers of migrating whales in 1981, 1982, 1986 and 1987 were 356, 396, 778 and 790 respectively, representing an increase of 130 to 140% over 5 years or an annual net increase of approximately 14%. The total numbers are underestimates, as recent evidence has shown that the northward migration continues beyond the period of observation. It is concluded that in antarctic Area V the population is increasing very rapidly, suggesting among other things that there is a plentiful supply of food, mainly krill, in the feeding grounds of that area. (Auth. mod.)

B-44820

Berkman, P.A., **Population biology of the antarctic scallop, *Adamussium colbecki* (Smith 1902) at New Harbor, Ross Sea**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.281-288, 57 refs.

The unexploited antarctic scallop, *Adamussium colbecki*, has a circumpolar distribution across the continental shelf from 0 to nearly 1500 m. During the 1986 summer *A. colbecki* was sampled with SCUBA to a depth of 30 m at New Harbor, in the southwestern Ross Sea. Quadrat collections revealed nearshore scallop densities up to 65/sq m with biomasses approaching 2 kg/sq m. Mark and recapture

experiments showed that *A. colbecki* grew an order of magnitude more slowly than temperate scallop species and analyses of shell growth bands indicated that it may live up to 20 years. Size frequency comparisons with earlier studies in the same area suggested that this scallop population has intermittent recruitment and is quite stable. Estimates of yield per recruit indicate that relatively low levels of fishing pressure could cause the New Harbor scallop population to collapse. (Auth.)

B-44821

Rodhouse, P.G., **Cephalopod fauna of the Scotia Sea at South Georgia: potential for commercial exploitation and possible consequences**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.289-298, 43 refs.

A collection of cephalopods from the British Antarctic Survey's Offshore Biological Programme is described and the cephalopod prey of vertebrate predators at South Georgia is reviewed. Comparison of these data indicates that predators catch larger specimens and a greater diversity of species than do nets. There are also differences between samples from different types of net. The RMT 25, the largest research net used to date, has caught most of the species thought to occur in the Scotia Sea, but specimens are generally smaller than those taken by predators. Cephalopods which are thought to have potential commercial value are *Martialia hyadesi*, *Kondakovia longimana*, *Moroteuthis ingens*, *M. Knipovitchi*, *M. robsoni* and *Gonatus antarcticus*. The possible consequences of commercial exploitation of cephalopods for the reproductive success of the vertebrate predators which prey on cephalopods in the Scotia Sea are examined. (Auth. mod.)

B-44822

North, A.W., Ward, P., **Feeding ecology of larval fish in an antarctic fjord, with emphasis on *Champscephalus gunnari***, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.299-307, 18 refs.

The vertical distribution of five species of fish larvae and their prey species was studied in late winter and summer at Cumberland East Bay, South Georgia. Prey type varied between fish species but was dominated by the copepod *Drepanopus forcipatus* and copepod eggs. Prey numbers increased with fish size. In summer, fish larvae and copepods were most abundant in the upper 120 m of the 265-m deep fjord, whereas in late winter both groups were more evenly dispersed throughout the water column. (Auth.)

B-44823

Kock, K.H., Köster, F.W., **State of exploited fish stocks in the Atlantic sector of the southern ocean**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.308-322, 35 refs.

Finfish have been harvested around South Georgia since the end of the 1960s, mainly by the Soviet Union. *Notothenia rossii marmorata* was the target species in the first peak years 1969-71, which yielded about 500,000 in two seasons. Since 1975/76 fishing has been directed mostly to the icefish *Champscephalus gunnari* and to a lesser extent *Patagonotothen brevicauda guntheri*. Catches of *C. gunnari* were highest at about 240,000, 220,000 and 100,000 in 1976/77-1977/78, 1982/83-1983/84 and 1986/87-1987/88. *N. rossii marmorata* is the species most adversely affected by the fishery. The present stock size is less than 5% of the level before the fishery started. Stocks of *C. gunnari* around the South Orkney Is. and in the Antarctic Peninsula region seem to be heavily depleted by fishing and are in need of conservation measures. *Patagonotothen br. guntheri* is the only species for which the fishery was unregulated until

1988/89. At high levels of mortality rate (0.8-0.9) stock size as well as recruitment indicate a downward trend. (Auth. mod.)

B-44824

Duhamel, G., Hureau, J.C., **Changes in fish populations and fisheries around the Kerguelen Islands during the last decade**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.323-333, 8 refs.

Four species of fish (*Notothenia squamifrons*, *N. rossii*, *Dissostichus eleginoides* and *Champsocephalus gunnari*) have been or are exploited in the shelf zone of Kerguelen Is. and the Skif Bank since 1970. However, detailed records of the fishery only date from 1980. Following the declaration of the exclusive economic zone in 1978, the fishery has been carefully controlled since stocks of *N. rossii* and *N. squamifrons* were shown to be severely depleted. This paper reviews the catch and fishing effort for the calendar years 1970 to 1978 and for the split years 1980/81 to 1987/88, and presents results on the changes in the demographic structures and the population abundance. These results were derived from virtual population analyses and catch per unit effort. The two methods, although completely independent from each other, show similar trends in the populations. A model utilizing data up to 1987 was used to predict future fluctuations of the populations given different levels of fishing activity. (Auth.)

B-44825

Tréhen, P., Frenot, Y., Lebouvier, M., Vernon, P., **Invertebrate fauna and their role in the degradation of cattle dung at Amsterdam Island**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.337-346, 33 refs.

At Amsterdam I., cattle were introduced in 1871 but there were no native coprophagous fauna. This chapter focuses on the succession of the fauna involved in dung degradation during a summer 90-day experiment and on changes in water, dry matter and nitrogen contents. A small number of invertebrate species was sampled from the dung and the soil beneath it. The presence of Diptera larvae (mainly *Fucellia tergina*), caterpillars (Noctuidae) and earthworms (*Dendrobaena rubida tenuis* and *D. subrubicunda*) was noticed. *Porcellio scaber* (Isopoda) was dominant, and the dry matter and nitrogen losses may be related especially to the activity of this species which leads to a coarse fragmentation of dung and its conversion to fecal pellet. (Auth.)

B-44826

Adamson, E., Seppelt, R.D., **Comparison of airborne alkaline pollution damage in selected lichens and mosses at Casey Station, Wilkes Land, Antarctica**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.347-353, 11 refs.

Umbilicaria decussata, *Usnea sphacelata*, *Ceratodon purpureus* and surface soil samples were collected at 10 m intervals for 90 m downwind of a concrete batching site at Casey Station. Comparable samples were collected from a similar uncontaminated remote site. Surface soil was alkaline in the immediate vicinity of the batching site (max. pH 8.8) and tended to decrease with distance. In the control site, surface soil was acidic (pH 4.7). Lichens growing downwind of the batching site were more susceptible to damage from airborne alkaline pollution than the mosses and were moderately to severely bleached. This chapter describes the relation between mean total chlorophyll concentration, chlorophyll a/b ratio, distance from the batching site and soil pH. Low temperature (77K) fluorescence of healthy plants from the control site and polluted plants 40 m downwind of the batching plant were compared. Variable fluorescence, in-

dicative of photosynthetic electron transport, was observed in all cases. (Auth. mod.)

B-44827

Crafford, J.E., Chown, S.L., **Introduction and establishment of the diamondback moth (*Plutella xylostella* L., Plutellidae) on Marion Island**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.354-358, 21 refs.

A small *Plutella xylostella* L. (Lepidoptera: Plutellidae) population was discovered in 1986 on Marion I. where larval feeding causes considerable damage to the native crucifer *Pringlea antiscorbutica* R. Br. Between Apr. 1986 and May 1988 the population was monitored to establish its dynamics, local distribution and the interaction of *P. xylostella* with its host. The first signs of larval infestation were detected at the start of Dec. The larval population rapidly built up to maximum density during Apr./May. At the onset of winter, the population crashed, with no sign of infestation during the remainder of winter and spring. The selective advantages that enabled the introduction and successful establishment of *P. xylostella* on Marion I. include cold tolerance and such traits as migratory ability, high fecundity, and rapid growth and generation turnover. *P. xylostella* should be regarded as a well-adapted colonizer on Marion I. (Auth. mod.)

B-44828

Crafford, J.E., **Role of feral house mice in ecosystem functioning on Marion Island**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.359-364, 21 refs.

The chief prey of feral house mice on Marion I. is larvae of the flightless moth *Pringleophaga marioni* Viette (Tineidae), which constitute about 50% of their diet throughout the year. The litter-dwelling, detritivorous larvae take more than 2 years to mature, during which time they are estimated to process at least 1500 t of litter annually on Marion I.'s vegetated coastal plain. The larvae facilitate the release of nutrients from plant litter through their feeding activity and the resultant enhancement of microbial decay. Mice remove daily 65 g/ha or 0.7% of the standing crop of *P. marioni* larvae on the island's coastal plain. The indirect effect of mouse predation, through the removal of a large proportion of decomposer biomass and subsequent impediment of nutrient mineralization, has implications for the functioning of the decomposer subsystem of the island's terrestrial ecosystem. Since mice and their prey appear to be in dynamic or even stable equilibrium, the direct impact of mice through predation may be eclipsed by these indirect detrimental effects to nutrient cycling. (Auth. mod.)

B-44829

Hunter, S., **Impact of introduced cats on the predator-prey interactions of a subantarctic avian community**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.365-371, 26 refs.

The distribution and feeding ecology of avian predator-scavengers were investigated to determine how the introduction of feral cats into the Marion I. ecosystem had affected predator-prey relationships within the island's avian community. Giant petrels fed mainly on penguins and did not compete with cats. Skua pairs specialized on the most abundant prey nearest to their territory, penguins or burrowing petrels. Cat predation has drastically reduced the number of burrowing petrels and few skuas now rely on these as their main prey source. Skua breeding density was highest next to large penguin colonies, and breeding success was related to the proximity of breeding sites. Indirect competition between skuas and cats for the declining number of burrowing petrels has probably led to changes in the

breeding and feeding ecology of the former as they adapt to shifts in prey distribution. Future changes in predator-prey interactions in the light of the current cat eradication program are discussed. (Auth.)

B-44830

Wood, W.F., Marsh, K.V., Buddemeier, R.W., Smith, C., **Marine biota as detection agents for low-level radionuclide contamination in Antarctica and the Southern Hemisphere oceans**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.372-378, 12 refs.

The Southern Hemisphere oceans are generally free of radionuclide contamination. This chapter reports on the use of marine biota as indicators of radionuclide contamination in these waters. Sampling methods were developed and were tested using plankton and the kelp, *Ecklonia radiata*, as bioconcentrators of artificial radionuclides. Plankton sampling yielded concentrations of radionuclides including Be-7, Nb-95 and Ce-144. Transplanted *E. radiata* was an efficient concentrator of I-131. Rapid uptake of I-131 by kelp plants was observed. Both the plankton and macroalgae sampling methods will detect low levels of nuclear fission products below levels detectable by conventional air filters. The methods are suitable for monitoring radionuclide concentrations in southern ocean and antarctic waters. Members of the Laminariales grow on subantarctic islands and are strategically placed to monitor radioactivity advecting eastward in the southern ocean. (Auth. mod.)

B-44831

El-Sayed, S.Z., Stephens, F.C., Bidigare, R.R., Ondrusek, M.E., **Effect of ultraviolet radiation on antarctic marine phytoplankton**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.379-385, 22 refs.

During Nov.-Dec. 1987, a series of experiments were conducted at Palmer Station to study the effects of ultraviolet radiation (UV) on phytoplankton collected from Arthur Harbor, Anvers I. Three parameters were studied: primary production rates; photosynthetic pigments; and photosynthesis-irradiance responses. These parameters were monitored during short-term and relatively long-term exposures to varying levels of UV radiation. The results of this month-long study provide evidence of some potentially deleterious effects of enhanced UV radiation on antarctic phytoplankton. The implications of these findings for the understanding of the ecology of the southern ocean are discussed. (Auth.)

B-44833

Abbott, S.B., Benninghoff, W.S., **Orientation of environmental change studies to the conservation of antarctic ecosystems**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.394-403, 35 refs.

The antarctic environment is changing because of the influence of human activities undertaken in the Antarctic and elsewhere in the world. The optimal approach for expanding knowledge of the causes and consequences of local and global environmental changes will be some combination of long-term basic and applied environmental research. This chapter describes the need for biological observations in appropriate time series to detect and determine the significance of changes in antarctic ecosystems; elements of successful environmental monitoring programs; how such programs might contribute to national and international research programs (e.g., the developing International Geosphere-Biosphere Program) as well as to conservation efforts (e.g., the environmental impact assessment process) in the Antarctic; needed improvements in antarctic environmental data management; and possible applications of new research and measure-

ment tools to improve the efficiency and cost effectiveness of both basic research and monitoring programs. (Auth. mod.)

B-44834

Hempel, G., **Antarctic ecosystems: change and conservation. Review of the Fifth Symposium on Antarctic Biology**, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.407-414.

The theme of the Fifth Symposium on Antarctic Biology, "Ecological Change and the Conservation of Antarctic Ecosystems" was chosen as a contribution to the current discussions on long- and short-term changes in Antarctica's environment and communities and on their future being threatened by tourism, research activities, fisheries and possibly exploration and exploitation of mineral resources. The broad perspective of climatic change was also taken into account. This review is based on summaries given at the closing session of the Symposium.

B-44848

Gilbert, N.S., **Microphytobenthic seasonality in near-shore marine sediments at Signy Island, South Orkney Islands, Antarctica, Estuarine, coastal and shelf science**, July 1991 33(1), p.89-104, 32 refs.

The seasonal pattern of the microphytobenthic community at a near-shore site on the east coast of Signy I. was examined over a period of 18 months. Sediment chlorophyll levels showed distinct seasonal variation linked to the photon flux density reaching the benthos. The microphytobenthic community was able to survive under ice and to respond rapidly to higher intensities that occurred following the breakout of the sea-ice. Seasonal variation in sediment organic content was lacking, but the diatoms constituted only 14% of sediment organic content, even at the peak of the benthic bloom. Low rates of sedimentation of material from the water column during the benthic bloom indicated that the benthic algae were mostly responsible for the increase in sediment chlorophyll concentrations. It is suggested that the benthos may play an important role in seeding the phytoplankton bloom through resuspension. (Auth.)

B-44849

Croxall, J.P., Prince, P.A., **Recoveries of Wandering Albatrosses *Diomedea exulans* ringed at South Georgia 1958-1986, Ringing and migration**, June 1990 11(1), p.43-51, 12 refs.

Ringing of 20,000 Wandering Albatrosses over 30 years at Bird I., South Georgia has produced only 81 recoveries (i.e. excluding controls), fairly evenly distributed between birds ringed as adults and as nestlings and between birds recovered 1-3 years after ringing (70% ex-nestlings) and subsequently. Recoveries (away from the vicinity of South Georgia) from 1960-1974 were mainly in Australasia (41%), followed by South America (34%); 17% of birds were found ashore, of the rest 38% were caught during fishing. From 1975-1988, recoveries were mainly in South America (65%), then Australasia (25%); 28% of birds were found ashore, of the rest 63% (almost equally adults and juveniles) were caught during fishing and three-quarters (64% adults) of these on long-lines set for tuna. The increase in recoveries associated with fishing, with long-lines in particular, and the decline of the Bird I. and several other breeding populations is probably more than coincidence. (Auth.)

B-44850

Wang, R., Chen, S.H., **Population structure of antarctic krill (*Euphausia superba* Dana) in the waters north and west of Antarctic Peninsula, Chinese journal of oceanology and limnology**, 1990 8(2), p.101-108, 15 refs.

Antarctic krill is a key organism of the antarctic marine ecosystem and a potential fishery resource. Its ecology was the major biological project in the First Chinese Antarctic Expedition (1985). Acoustic observations and IKMT tows were made in waters north and west of Antarctic Peninsula. Environmental factors were also observed. Analyses of the population structure, i.e. the sex percentage distribution and other data obtained, show that among the 3,640 individuals of determinable sex, only 38.1% were males and that the larger the body length the smaller the percentage of males, for example, male percentage dropped to 8.3% for size group >55 mm. The population's relations to environmental factors are also discussed. (Auth.)

B-44858

Cooper, J., Siegfried, W.R., Ryan, P.G., Crafford, J.E., Stock, W.D., **Effects of ornithogenic products on ecosystem structure and functioning: a new South African biological antarctic research subprogramme, *South African journal of science***, June 1991 87(6), p.223-226, 20 refs.

Birds are one of the main agents supplying nutrients to inland nunataks in Antarctica, which are among the most isolated ecosystems in the world and may be regarded as islands in a sterile field of ice. Nunataks support simple ecosystems, consisting primarily of bacteria, yeasts, fungi, algae, lichens, mosses, protozoa, rotifers, tardigrades, nematodes, collembolans and mites. Seabirds, of only a few species and at scattered localities, are the largest members of the biota. Reasons for South African involvement in biological research on the antarctic continent are given and the results of a preliminary biological survey are summarized. The effects of ornithogenic products on ecosystem structure and functioning of antarctic nunataks are little known. The South African Biological Antarctic Research Subprogramme (SABARSP) which intends to study these effects is planned to commence in Apr. 1991, and to run initially for five years. It is briefly described and an appeal is made for the involvement of interested scientists. (Auth.)

B-44860

Semina, G.I., Zernova, V.V., **Phytoplankton biomass in the Pacific Ocean, *Oceanology***, Feb. 1990 29(4), p.487-492, 28 refs.

A distribution map has been prepared of the biomass in the Pacific Ocean, including the antarctic region, using the large amount of both original data and that derived from the literature. Eight distinct regions have been isolated. Sedimentation and reverse filtration (considering phytoplankton over 15 microns in cell diameter) methods were used to collect the data from which the map is made. The biomass as calculated by sedimentation is composed of larger cells than is the biomass obtained by the filtration method. The average cell volume by the sedimentation method and that by the filtration method differs most significantly in the impoverished regions. (Auth.)

B-44872

Decraemer, W., **Revision of *Epsilonema* species from Antarctica described by Steiner (1931) (Nemata), *Nematologica***, 1991 37(1), p.20-37, 4 refs.

This study deals with *Epsilonema* species from Antarctica. A revision was made of epsilonematids from the German South Polar Expedition of 1901-1903 described by Steiner (1931). It is based on type specimens from Steiner's collection and on material from the U.S. Antarctic Research Program 1969-1970. Two *Epsilonema* species: *E. cyrtum* Steiner, 1931 and *E. docidocricum* (Steiner, 1931) Lorenzen, 1973 were identified. *E. docidocricum* is re-established as a valid species, characterized by a striated ornamentation of the body cuticle, 151-173 body rings, amphidial fovea without sexual dimorphism in shape and dimensions and situated posteriorly on the head, and in the male by the lack of copulatory corns. *E. cyrtum* is redescribed. (Auth.)

B-44873

Oehlenschläger, J., **Chemical composition of the flesh and other tissues of antarctic fish species of the families Channichthyidae and Nototheniidae, *Food chemistry***, 1991 40(2), p.159-167, 12 refs.

The muscle, intestinal tract, stomach, spleen, heart, pyloric caeca, gonads and liver of 4 antarctic fish species, *Notothenia neglecta*, *Notothenia gibberifrons*, *Chaenocephalus aceratus* and *Champsocephalus gunnari*, were analyzed for moisture, crude protein, carbohydrate, fat, ash, chloride and phosphorus. The chemical composition of the flesh of the fish showed that all 4 species are valuable food fishes with a high protein (17-19%) and a low to moderate fat content (0.8-1.9%). In all fishes investigated high amounts of trimethylamine oxide-nitrogen were present. During distillation only nototheniids underwent deamination reactions leading to high TVB-N values; ice-fishes were unaffected. *N. neglecta* and *N. gibberifrons* were found to store considerable amounts of carbohydrates and fat in their livers (4.6% and 8.2% carbohydrates and 16.3% and 14.4% fat, respectively). *Ch. gunnari* accumulates fat in intestinal tract, spleen and pyloric caeca. The stomachs of all fishes had high chloride levels. The livers of *Chaenocephalus aceratus* were heavily infested (up to 20 wt%) by the parasitic nematode *Contracaecum* spec. (Auth. mod.)

B-44874

Marchant, H.J., Davidson, A.T., Kelly, G.J., **UV-B protecting compounds in the marine alga *Phaeocystis pouchetii* from Antarctica, *Marine biology***, July 1991 109(3), p.391-395, 32 refs.

Phaeocystis pouchetii (Hariot) Lagerheim is widely distributed in polar waters, and forms massive near-surface blooms in the marginal ice-edge zone around Antarctica during spring and summer. UV irradiance in the antarctic marine environment is reportedly as high in Oct. and Nov. as in mid-summer due to stratospheric ozone depletion. Because of the location and timing of the *P. pouchetii* bloom, this prymnesiophyte will be exposed to high levels of UV-B (280-320 nm) radiation. Colorless water-soluble compounds, produced by the colonial stage in the life cycle of this alga, absorb strongly between 250 and 370 nm, with absorbance maxima at 271 and 323 nm. The concentration of these compounds in cultured *P. pouchetii* depends on the strain, stage in the life cycle, and presence of bacteria. As well as conferring substantial protection to this alga, these substances may also provide UV protection to other organisms present in the water column. (Auth.)

B-44875

Björnsen, P.K., Kuparinen, J., **Growth and herbivory by heterotrophic dinoflagellates in the southern ocean, studied by microcosm experiments, *Marine biology***, July 1991 109(3), p.397-405, 42 refs.

Growth and herbivory of heterotrophic dinoflagellates (*Gymnodinium* sp.) from the Weddell Sea and the Weddell/Scotia Confluence were studied in 1988 in 100 liter microcosms. The microcosms were screened through 200 micron or 20 micron mesh nets and incubated for 12 d at 1 C under artificial light. Dinoflagellate growth rate followed a Holling type II functional response, with a maximum growth rate of 0.3/d and half-saturation food concentrations of 1.0 microgram chlorophyll *a*/l, 50 microgram C/l, or 1500 cells/ml. Carbon budgets based on CO₂-14 assimilation and biomasses of phytoplankton and heterotrophic dinoflagellates suggested a balance between phytoplankton grazing loss and dinoflagellate consumption, assuming a dinoflagellate carbon conversion efficiency of 40%. Applying this to the functional response yielded estimates of maximum ingestion rate and maximum clearance. The microcosm experiments suggested that heterotrophic dinoflagellates may contribute significantly to maintenance of low phytoplankton biomass in the southern ocean. (Auth. mod.)

B-44877

Delille, D., Bouvy, M., **Relationship between viable and direct bacteriological counts in southern polar marine waters**, *Vie et milieu*, Dec. 1990 40(4), p.281-284, 23 refs.

While microscopic direct counts are related to total bacterial biomass, viable bacterial counts are assumed to be representative of only a relatively small part of seawater bacteria. Such an assumption is certainly true in conditions of low nutrient concentrations, but must be considered carefully in more eutrophic situations, as shown in this paper. Great similarities between viable and direct bacterial counts were indeed observed from several studies in southern polar zones. (Auth.)

B-44878

Grygier, M.J., **Introcornia** (Crustacea: Ascothoracida: Petrarcidae) parasitic in an ahermatypic coral from Saint Paul Island, Indian Ocean, *Vie et milieu*, Dec. 1990 40(4), p.313-318, 9 refs.

Two specimens of the ascothoracidan *Introcornia australis* sp. nov., the second known species of its genus, have been found in an internal gall in a branch of the scleractinian *Lophelia pertusa* (L.) dredged from a depth of 460-510 m off Saint Paul I. in the southern Indian Ocean. The new species is described and compared with *I. conjugans*, a Japanese species, and some aspects of its morphology are discussed. *L. pertusa* represents a new subfamily of hosts for ascothoracidans of the family Petrarcidae. (Auth.)

B-44884

Schroeter, B., Kappen, L., Moldaenke, C., **Continuous *in situ* recording of the photosynthetic activity of antarctic lichens—established methods and a new approach**, *Lichenologist*, 1991 23(3), p.253-265, Refs. p.264-265.

A new method is described that records the periods of photosynthetic and respiratory activity in lichen thalli *in situ* by measuring the actinic chlorophyll fluorescence response of the photobiont. The technique is based on a pulse amplitude modulation fluorometer that was specially developed for continuous and unattended measurements in the Antarctic. On Livingston I. the periods of metabolic activity of *Usnea antarctica* were recorded simultaneously with the microclimatic parameter in its natural environment. In the laboratory, both the actinic fluorescence response and the photosynthetic rate as a function of thallus water content were investigated in *Caloplaca regalis*. The experiments revealed a quantitative relationship between actinic fluorescence and photosynthetic rate within the range of optimum to limiting low thallus water content. The method described is suitable for measurements of lichen activity in field microclimate studies and should allow continuous unattended year round measurements of lichen activity, which are needed in remote regions such as Antarctica. (Auth. mod.)

B-44885

Wang, Z.P., **Ecology of *Drepanopus bispinosus* (Copepoda: Calanoida) and the effects of environmental factors on it in a meromictic lagoon, Antarctica**, *Antarctic research*, 1991 3(1), p.1-13, In Chinese with English summary. 22 refs.

The copepod *Drepanopus bispinosus* was studied from Dec. 1983 to Jan. 1985, showing one generation per year. The male's life cycle is 10 to 12 months, the female's 12 to 18 months. The population density shows marked seasonal variations. The highest density of adults occurs June to Sep., the highest density of the nauplii takes place in Nov., and that of copepodites in Jan. Reproduction occurs from June to the following Jan. There are two reproductive peaks during this period: July to Aug., where most nauplii perish through lack of food and low dissolved oxygen, and Oct. to Dec., where most nauplii reach the copepodite and later the adult stage. The ecological

characteristics of populations are related to seasonal changes in the meromictic lake. The copepods mate and lay eggs in winter and spring, during the relative stability of the lake's temperature and salinity.

B-44888

Zhang, C.G., Gao, Y.T., **Preliminary report on the birds around the Great Wall Station, Antarctic research**, 1991 3(1), p.30-38, In Chinese with English summary. 9 refs.

Observation of bird populations in the vicinity of the Great Wall Station disclosed the existence of 11 species, belonging to 6 families: Spheniscidae: *Pygoscelis adeliae*, *P. antarctica*, *P. papua*; Procelariidae: *Macronectes giganteus*; *Daption capense*; Hydrobatidae: *Oceanites oceanicus*; Phalacrocoracidae: *Phalacrocorax atriceps*; Stercorariidae: *Catharacta maccormicki*, *C. lonnbergi*; Laridae: *Larus dominicanus*, *Sterna vittata*. Their ecology, population, nutrition, behavior and reproduction are described. It is found that the food chain in the area is relatively simple; almost all species feed on a great abundance of euphausiids, cephalopods and fish, with penguins consuming the largest amounts of krill. Penguins are in turn victims of other animals; their eggs or juveniles are taken by skuas, giant fulmars, black-backed gulls; seals are the major predator of penguins at sea. (Auth. mod.)

B-44893

Zwick, P., **Transantarctic relationships in the Plecoptera**, *Series entomologica*, 1990 Vol.44, Mayflies and stoneflies: life histories and biology. Proceedings of the 5th International Ephemeroptera Conference and the 9th International Plecoptera Conference, Marysville, Australia, Feb. 18-24, 1987. Edited by I.C. Campbell, p.141-148, 14 refs.

DLC QL505.I56

It is found that some suggestions in the past that distribution of some families of Plecoptera provide good evidence for the former existence of Gondwanaland, relied on assumptions of phylogenetic relationships and were subsequently disproven or strongly weakened by cladistic analysis. At the same time, cladistic analysis has provided very good evidence from the distribution and affinities of the families of the suborder Antartoperlaria. In most subgroups of Antartoperlaria diversity is too low for a finer analysis, but the Leptoperloidea appear promising for a more detailed study of phylogeny and distribution. However, present knowledge is inadequate and existing infra-familial classifications are at best tentative. (Auth. mod.)

B-44896

Moser, M., Cowen, R.K., **Effects of periodic eutrophication on parasitism and stock identification of *Trematomus bernacchii* (Pisces: Nototheniidae) in McMurdo Sound, Antarctica**, *Journal of parasitology*, Aug. 1991 77(4), p.551-556, Refs. p.555-556.

McMurdo Sound is suited for the study of the effects of eutrophication on diet-related parasites of *Trematomus bernacchii* (Boulenger, 1902) (Pisces). It has been relatively well studied, the environment is predictable, and there are significant differences in primary productivity over small distances. The differences in parasitism for 5 helminth species can be attributed to the enrichment processes in the sound. The prevalences of the acanthocephalan *Echinorhynchus* sp., the nematode *Ascarophis nototheniae*, the digenean *Dinosoma* sp., and the cestode *Phyllobothrium* sp. are significantly higher on the east side of the sound than on the west. The prevalence of the digenean *Lepidepedon garrardi* is significantly higher on the west side. The differences in the prevalences of infection between the east and west sides suggest that at least the benthic adult fish do not readily move from one side of the sound to the other. (Auth. mod.)

B-44897

Buma, A.G.J., Bano, N., Veldhuis, M.J.W., Kraay, G.W., **Comparison of the pigmentation of two strains of the Prymnesiophyte *Phaeocystis* sp.**, *Netherlands journal of sea research*, June 1991 27(2), p.173-182, Refs. p.180-182.

Two strains of *Phaeocystis* sp., one isolated from the Weddell Sea region and one from the North Sea, were compared for their growth characteristics and pigmentation during growth in batch cultures. Experiments were performed starting with identical nutrient and light conditions at 2 C, 7 C and 10 C. Division rates ranged from 0.17 to 0.94/d depending on strain and temperature: the antarctic strain grew fastest at 2 C ($\mu=0.71/d$), the strain from the North Sea at 10 C ($\mu=0.94/d$). Growth phase, phase in the diurnal cycle and temperature influenced the 19'hexanoyloxyfucoxanthin to chlorophyll *a* ratio in both strains. Large differences in this ratio were found between flagellates and colony cells from the same strain. Despite variability within each strain, mean levels of 19'hexanoyloxyfucoxanthin were always higher in the antarctic strain. Another fucoxanthin-related pigment, 19'butanoyloxyfucoxanthin, showed the same trends during growth as 19'hexanoyloxyfucoxanthin in the antarctic strain but was undetectable in the strain isolated from the North Sea. (Auth. mod.)

B-44899

Calcagno, J.A., **Bird distribution on Nelson I.** [Distribución de las aves de la isla Nelson, Antártida Argentina], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.376, 18p., In Spanish with English, German and French summaries. 3 refs.

A numerical account is given of the species of nesting birds observed on Nelson I. during the summer of 1987-1988. Visiting birds, not nesting on the island, are also counted; changes in the number of colonies during the last 20 years are discussed. The topographic peculiarities of the different areas are studied in relation to the species occupying them. A decline in bird populations is related to tourist activities on the island; a chart with data of these activities between Dec. 4 and Feb. 7 is provided.

B-44916

Rauschert, M., ***Pseudodulichia*, a new genus of the Podoceridae from the Antarctic (Crustacea: Amphipoda: Gammaridea)** [*Pseudodulichia*, eine neue Gattung der Podoceridae aus der Antarktis (Crustacea: Amphipoda: Gammaridea)], *Zoologisches Museum, Berlin. Mitteilungen*, Sep. 1990 66(2), p.371-374, In German with English summary. 8 refs.

The systematic position of *Dulichia antarctica* Rauschert, 1988 had to be revised. Some of its characters made it necessary to erect a new genus, *Pseudodulichia* gen. n., for this species. (Auth.)

B-44925

Numanami, H., Okutani, T., **New and two known species of the genus *Anatoma* collected by the icebreaker *Shirase* from Breid Bay and G  nnerus Bank, Antarctica (Gastropoda: Scissurellidae)**, *Venus*, 1990 49(2), p.93-106, 28 refs.

Among the benthos materials collected by the icebreaker *Shirase* from Breid Bay and G  nnerus Bank, three species of the scissurellid gastropods were found: *Anatoma amoena*, *A. euglyptus* and *A. shiraseae* n. sp. Morphological details of these three species are described. (Auth.)

B-44929

Kunzmann, A., **Blood physiology of high-antarctic fish** [Blutphysiologie hochantarktischer Fische], *Polarforschung*, 1989(Pub. 1991) 59(3), p.129-139, In German with English summary. 39 refs.

High-antarctic fishes from the eastern and southeastern Weddell Sea were caught in depths between 200 and 2,000 m and maintained in aquaria during the *Polarstern* ANT-VII/4 expedition (EPOS 3, 1989). Investigations on the blood physiology were performed for 16 species; for most of them it was the first time. Emphasis was put on the determination of various parameters such as pH, pO₂, pCO₂ (partial pressure of O₂ and CO₂), Hb (Haemoglobin), RBC (red blood cells) as well as on structural and functional studies of Hb. Since all notothenioid fishes display the tendency to reduce both the red blood cell number as well as the Hb content, the data allow conclusions about a possible tree of evolution. Antarctic teleosts seem to have one major haemoglobin. The second Hb, which has been found in nearly all notothenioids, accounts for only 5-10% of the total. Furthermore, nearly all investigated haemoglobins display pronounced Root- and Bohr effects. As multiple Hb's with functional difference reflect the necessity to cope with varying environmental conditions, the rather simple cases shown here fit well to constant physico-chemical conditions of high-antarctic seas. The sequence identity in amino acids of haemoglobins can reach 90% within antarctic species, even if investigated species belong to different families. This reflects their common origin. A clearly lower sequence identity with non-antarctic fishes, although with similar protein function, indicates a high selective pressure south of the Antarctic Convergence. (Auth.)

B-44940

Tiefenbacher, L., **Notes on some mesopelagic shrimps and their distribution in western antarctic waters, *Spixiana***, July 1991 14(2), p.153-158, In German with English summary. 19 refs.

Mesopelagic shrimps of the caridean species *Systellaspis braueri* (Balss, 1914) and *Pasiphaea scotiae* (Stebbing, 1914), and of the penaeidean species *Gennadas kempfi* Stebbing, 1914 and *Petalidium foliaceum* Bate, 1881 are described. The specimens were collected on F.R.V. *Walther Herwig* ANT II and R.V. *Polarstern* ANT III/3, ANT V/I, ANT VI/2 and ANT VII/2 (EPOS I). *Systellaspis braueri* is for the first time recorded from the antarctic region beyond the Antarctic Convergence. For *Pasiphaea scotiae* the most southern record is described in the eastern Weddell Sea. *Gennadas kempfi* was for the first time sampled from south of America and it is the second reference for the high Antarctic. Finally, *Petalidium foliaceum* is new to the western Antarctic. (Auth.)

B-44942

Lange, U., Meissen, J., **Additional preliminary data on bird species of southwestern King George Island (South Shetland Islands, Antarctica)** [Weitere Erstnachweise von Vogelarten im S  dwesten von King George Island (S  dshetland-Inseln, Antarktis)], *Beitr  ge zur Vogelkunde*, 1990 36(3/4), p.165-170, In German. 22 refs.

As a part of the biological program at Bellingshausen Station during the DDR 1st Antarctic Expedition from Dec. 1987 through Mar. 1989, several significant observations were made. Previously unreported from the South Shetlands, two new species were recorded on Fildes Peninsula: the king penguin and the black throated swan. Brief histories of the two species are given, the circumstances of the sightings are described, and photographs of the free-swimming or rock-walking birds are shown.

B-44944

Weimerskirch, H., **Sex-specific differences in molt strategy in relation to breeding in the Wandering Albatross**, *Condor*, Aug. 1991 93(3), p.731-737, 22 refs.

The extent of molt of primary feathers was studied in relation to the status and to the duration of the interval between breeding attempts in the Wandering Albatross (*Diomedea exulans*). The replacement of primaries lasts for more than one season, birds showing a typical wave molt with one to three foci occurring on a wing. Molt never occurs on the breeding grounds. In breeding as in nonbreeding individuals, males invariably renew more feathers than females. Breeding males and females renewed each year an average of 8.3 and 7.3 primaries per wing, respectively. The extent of primary molt of breeders was directly related to the duration of the interbreeding period in females but not in males. Males and females breeding for the first time had fewer new feathers than did experienced birds. When they visited the nesting colonies, immature birds had fewer new feathers than did breeding birds of the same sex. In immature birds, the extent of molt was related to the body condition (mass) of males but not of females. The extent of molt was inversely related to mass gain from one season to the next in nonbreeding males. These results suggest that molting in the Wandering Albatross is probably an important constraint that could compete with breeding, particularly in females. Possible reasons for sex-specific differences in molt extent are discussed. (Auth.)

B-44945

Croll, D.A., Osmek, S.D., Bengtson, J.L., **Effect of instrument attachment on foraging trip duration in Chinstrap penguins**, *Condor*, Aug. 1991 93(3), p.777-779, 12 refs.

In this study, examining the potential effects of attaching radio transmitters and time-depth recorders (TDRs) on the foraging trip durations of Chinstrap penguins breeding on Seal Is., it is found that the radio transmitters may have decreased the birds' travelling speed by 7% and the TDRs may have decreased it by 15%. These potential decreases probably explain why the birds with attached devices had longer average trip durations: more time was needed to search an adequate area to obtain sufficient prey to satisfy the needs of the adult and to return with a food load for the chick(s). The nests of birds with attached radio transmitters contained, on average, fewer chicks than the control and TDR groups.

B-44948

Holm-Hansen, O., Mitchell, B.G., **Spatial and temporal distribution of phytoplankton and primary production in the western Bransfield Strait region**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.961-980, Refs. p.978-980.

Studies on phytoplankton were one component of the multi-disciplinary RACER program, which had 69 stations in the southwestern Bransfield Strait and contiguous waters, between Dec. 1986 and Mar. 1987. All deep stations north of the continental shelf break were low in phytoplankton biomass and in rates of primary production as compared to stations in continental shelf waters. Greatest phytoplankton biomass was found at stations in Gerlache Strait and in nearby Bransfield Strait. Dramatic seasonality in phytoplankton crop size was observed, as massive blooms during Dec. to Jan. declined abruptly to low levels in Feb. to Mar. As the decrease in phytoplankton biomass was much more abrupt than the corresponding decrease in incident solar irradiation, light does not appear to be the major factor involved in decline of the bloom. Except for stations in Gerlache Strait, nutrient levels remained sufficiently high that nutrient depletion is not likely to have caused the rapid decline of the phytoplankton bloom. Grazing, sinking and advection all appear to be important mechanisms of massive bloom decline. Phytoplankton populations appeared to be low-light adapted. (Auth. mod.)

B-44949

Mitchell, B.G., Holm-Hansen, O., **Observations and modeling of the antarctic phytoplankton crop in relation to mixing depth**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.981-1007, Refs. p.1004-1007.

The multi-disciplinary program RACER conducted 8 surveys of a 69-station grid in the southwestern Bransfield Strait from Dec. 1986 to Mar. 1987. Mean phytoplankton crop size in the upper 50 m during Dec., Jan., Feb. and Mar. was 291, 176, 58 and 50 mg Chl *a*/sq m, respectively, and was inversely proportional to the increasing mean depth of the upper mixed layer (UML) (15, 17, 26 and 30 m, respectively). Massive mid-summer phytoplankton blooms (> 10 mg Chl *a* + phaeo/cu m) were persistent nearshore where shallow UMLs (< 20 m) were observed, caused by meltwater stabilization. Drake Passage waters were low in phytoplankton biomass, and had deep UMLs (> 20 m) with small density gradients. Proximity to stabilizing meltwater and protection from intense antarctic storm activity appear to be essential for the development of persistent massive blooms. A model of antarctic phytoplankton growth based on mixing depth and pigment-specific light attenuation and *in situ* photosynthesis-irradiance relationships indicates that the depth of the UML can be used to predict the upper limit of the phytoplankton crop size. Observed phytoplankton biomass for diverse southern ocean ecosystems is discussed in relation to the mean light level of the UML, growth and loss rates of antarctic phytoplankton, and the depth and duration of stratification required before a bloom ensues. (Auth. mod.)

B-44951

Karl, D.M., **Microbial biomass and productivity in the western Bransfield Strait, Antarctica during the 1986-87 austral summer**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1029-1055, Refs. p.1053-1055.

Rates of assimilation of tritiated organic compounds (glutamate, thymidine, adenine) paralleled the total microbial biomass estimates. Chlorophyll *a* concentrations achieved maximum values in Dec., began to decline in Jan. and exhibited a rapid decrease in Feb. and Mar. The mean cell size of the planktonic assemblage did change, however, from a predominantly microplankton (> 20 micron) crop in Dec. to one dominated by nanoplankton (< 20 micron) later in the season. Total microbial biomass, as estimated by measurement of ATP, increased between Dec. and Jan., followed by a rapid decline in Feb. and Mar. However, the putative microheterotrophs, bacteria, showed no significant increases either during or immediately following the Dec. to Jan. bloom of phytoplankton, in apparent contrast to studies reported from temperate waters. Bacterial cell numbers did not vary systematically during the 4-month period of observation and thus appeared to be "uncoupled" from phytoplankton dynamics. Rates of assimilation of tritiated organic compounds (glutamate, thymidine, adenine) paralleled the total microbial biomass estimates. All available data suggest that much of the measured heterotrophic activity may be due to the activity of phytoplankton cells. (Auth. mod.)

B-44956

Huntley, M., Escritor, F., **Dynamics of *Calanoides acutus* (Copepoda: calanoida) in antarctic coastal waters**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1145-1167, 27 refs.

Observations of the population dynamics, distribution, abundance, feeding activity and egg production of *Calanoides acutus* were made in the period from mid-Dec. 1986 to late Mar. 1987. Spawning is presumed to have begun as early as Oct., since the population reached the copepodite I state of development by early Dec. Egg production, which was not related to ambient chlorophyll concentrations in the range 4.4-18.5 micrograms/l, ceased by mid-Jan. Feeding intensity of adult females, indicated by gut pigment content, was correlated with surface chlorophyll concentration. No evidence was found for diel periodicity in feeding. Younger copepodite stages (CI-CIII) were concentrated in the 0-100 m depth stratum, whereas later stage copepodites tended to be equally distributed throughout the upper 200 m. No evidence was found for diel vertical migration. All copepodite stages in the Gerlache Strait tended to be concentrated

in the upper 100 m. Abundance of *C. acutus* was consistently greater in Gerlache Strait waters than elsewhere in the study area. The population attained overwintering copepodite stages CIV and CV by Mar. Downward ontogenetic migration of the overwintering stages occurred in the Drake Passage by late Mar., but was delayed in the relatively food-rich waters of the Gerlache Strait. (Auth.)

B-44957

Brinton, E., **Distribution and population structures of immature and adult *Euphausia superba* in the western Bransfield Strait region during the 1986-87 summer**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1169-1193, Refs. p.1191-1193.

Interrelationships among body size, maturity state and spatial distribution in immature and adult *Euphausia superba* were examined through the course of the 1986-87 reproductive season in a region centered in western Bransfield Strait and extending northward into Drake Passage and southward into Gerlache Strait. During an initial (Dec. to Jan.) peak in production of phytoplankton and krill larvae in Gerlache Strait and adjacent parts of Bransfield Strait, so few post-larvae and adults were caught that the parent stock of those larvae could not be identified with certainty. In Bransfield Strait during late summer (late Feb. to Mar.) there was a nearly equal mixture of small adults and large adults (>42 mm); the large adults showed most evidence of recent reproductive activity and could have been responsible for much of the late summer larval recruitment in Bransfield Strait. In Drake Passage, large adults were usually dominant. During late Feb. to Mar., krill became more available in Drake Passage, with many having reassembled in aggregations near Livingston I. By then, not only small adults but also large adults appeared post-reproductive in all areas. The Gerlache-Bransfield Straits and similar coastal habitats must be considered nursery areas, not only for immature krill as has been previously proposed, but also for early summer larvae. In particularly productive years, as in 1986-87, these coastal waters may become spawning localities for small adult krill before reproduction by large adults develops farther away from the Peninsula. Immatures of <12 mm in Dec. and ca 16-30 mm by Mar., comprised a subgroup of the smallest immature krill, though not consistently abundant enough to be distinguished as a year class. Their distributions suggest origins and early growth outside of the study area, possibly in the Weddell Sea and coastal waters of the Bellingshausen Sea. (Auth. mod.)

B-44958

Brinton, E., Townsend, A.W., **Development rates and habitat shifts in the antarctic neritic euphausiid *Euphausia crystallorophias*, 1986-87**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1195-1211, Refs. p.1210-1211.

Dynamics of distribution and growth were studied in the coastal antarctic euphausiid *Euphausia crystallorophias* in the western Bransfield Strait region during the 1986-87 summer. The life phases showed differences in distribution. After the start of reproduction, which was well underway in Dec. across shelf and open waters of the straits, the Jan. distribution of larvae expanded with concentrations near the Peninsula, along the main Bransfield Current, and, to a lesser extent, around the South Shetlands. In Feb. the distribution retracted toward the Peninsula as abundance diminished greatly. By Mar., larvae were found only north of the South Shetlands and in the Gerlache Strait area where highest numbers had been observed through the season. Juveniles, believed to be 1 year old, and subadults, 2 years old, appeared to be randomly dispersed across the region at all times. The few specimens of the adult class were from within or near embayments. Most Dec. larvae were nauplii, metanauplii and Calyptopis 1. In Jan., older calyptopis stages were dominant. Latest observed eggs and nauplii were in Jan. inside the Deception I. caldera. During Feb. to Mar., development progressed from the calyptopis phase to the furcilia phase, and mean abundance of larvae declined from the >100 sq m level of Jan. to <10 sq m. Most late Mar. larvae were

furcilia stages 2 and 3, averaging one stage less than the more rapidly growing *E. superba* which had begun reproduction about a month later than *E. crystallorophias*. (Auth. mod.)

B-44959

Huntley, M., Brinton, E., **Mesoscale variation in growth and early development of *Euphausia superba* Dana in the western Bransfield Strait region**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1213-1240, Refs. p.1239-1240.

Development and growth of larval *Euphausia superba* were measured in field and laboratory populations in the western Bransfield Strait from Dec. 1986 to Mar. 1987. Three principal biogeographic zones were identified: northern Gerlache Strait, Bransfield Strait and Drake Passage; these were recognizable by consistent patterns of physical circulation. Two cohorts of *E. superba* larvae were produced. The first cohort appeared as C1 larvae in mid-Jan., and the second appeared in mid-Feb.; the second cohort did not occur in Gerlache Strait waters. Larvae in Gerlache Strait were more abundant, larger in size and weight, better fed, and developed and grew more rapidly than larvae of the same stages in both Bransfield Strait and Drake Passage. In Gerlache Strait abundance reached 12,000 individuals/sq m. It is proposed that the northern Gerlache Strait is a primary nursery area for *E. superba*, and that local circulation promotes high primary productivity and prolongs the residence time of larvae in a nearshore environment which is favorable to development and growth. Coastal environments such as Gerlache Strait may make a disproportionately large contribution to annual krill recruitment. (Auth. mod.)

B-44960

Marin, V.H., Brinton, E., Huntley, M., **Depth relationships of *Euphausia superba* eggs, larvae and adults near the Antarctic Peninsula, 1986-87**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1241-1249, 22 refs.

Relationships of depths of adult *Euphausia superba* to depths of its eggs and larval stages were examined during the 1986-87 summer at three localities west of the Antarctic Peninsula. Data were obtained relating to spawning depth and to extents to which larval stages co-occur and vary in depth through the season. Reproductive adults occurred at all depths sampled in late Dec. in Bransfield Strait and in all but one stratum in late Jan. to a depth of 2000 m in Drake Passage. Mature males were caught together with gravid females and freely sinking eggs down to at least 1000 m in Drake Passage and to more than 500 m in Bransfield Strait, providing indirect evidence that spawning can take place over extensive ranges of depth. In the 300-400 m deep Gerlache Strait, where larvae were particularly numerous (Jan. to Mar.), only a few reproductive adults were caught, and only in Dec. at 100-200 m. (Auth.)

B-44961

Loeb, V.J., **Distribution and abundance of larval fishes collected in the western Bransfield Strait region, 1986-87**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1251-1260, 16 refs.

Larval fishes were obtained from 0-50 m Bongo net and stratified 0-200 m Nansen net samples collected in the western Bransfield Strait region during 4 RACER program cruises, Dec. 1986 to Mar. 1987. Three nototheniid species, *Nototheniops larseni*, *Notothenia gibberifrons*, and a form tentatively identified as *Trematomus scotti* numerically dominated the total catch. Two typically abundant species in this area, *Pleuragramma antarcticum* and *Notothenia kemp*, were relatively uncommon. Largest abundances occurred in the vicinity of Gerlache Strait and island shelf areas; larvae were infrequently collected in Drake Passage waters. Individual species demonstrated different distributional patterns, suggesting that water mass influence, larval depth distribution and behavioral differences may be involved.

Estimated Jan. to Mar. growth rates for *N. larseni* (0.06 mm/day) and *T. scotti* (0.05 mm/day) are similar but low compared to that of *N. gibberifrons* (0.12 mm/day). (Auth. mod.)

B-44962

Bucher, T.L., Chappell, M.A., Morgan, K.R., **Ontogeny of oxygen consumption and ventilation in the Adélie penguin, *Pygoscelis adeliae*, Respiration physiology**, 1990 82(3), p.369-388, 35 refs.

Although both energy metabolism and ventilation parameters are highly size dependent in adult birds, the usual scaling relationships with mass do not hold in hatchlings or in growing chicks. In Adélie penguins, three distinct behavioral phases during growth and development are reflected in the ontogeny of metabolism and ventilation. Metabolic intensity increases in the nestling phase (age 0-11 days), stabilizes during the creche phase (14-40 days), and decreases in fledglings (40-55 days) and adults. Minimal respiratory frequency does not change with mass in nestlings, decreases in creche chicks, and falls abruptly in fledglings and adults. Mass-specific standard tidal volume and mass-specific standard minute volume do not change with mass in nestlings, increase abruptly at 14 days, decline with increasing mass in creche chicks, and are not correlated with mass in fledglings and adults. Oxygen extraction at minimal frequency increases with increasing mass in nestlings and in creche chicks, and it declines with increasing mass in fledglings and adults. At any given age, Adélie penguins usually accommodate changing thermogenic demand primarily by adjusting minute volume rather than oxygen extraction. (Auth.)

B-44963

Little, G.J., **Thyroid morphology and function and its role in thermoregulation in the newborn southern elephant seal (*Mirounga leonina*) at Macquarie Island, Journal of anatomy**, June 1991 Vol.176, p.55-69, Refs. p.67-69.

The thyroid gland of the southern elephant seal is markedly active at birth, playing a vital role in maintaining the body temperature of the newborn seal when it enters the harsh environment of the subantarctic. Thyroid epithelial cell height is cuboidal to columnar for pups from birth to 48 hours *postpartum* after which it decreases by five days of age. Ultrastructurally the thyroid epithelial cells show pseudopodia protruding into the lumen at zero, two and six hours after birth. After 24 hours *postpartum* pseudopodia are rarely observed in thyroid follicles from two to 20 day old pups. The number of colloid droplets increases by six hours after birth and they are distributed throughout the cytoplasm. At 24 hours and two days, few colloid droplets are observed. The observed changes in thyroid epithelial cell height and ultrastructure are strongly suggestive of increased secretion of thyroid hormones during the first six hours of postnatal life. This pattern of thyroid activity is similar to that in other newborn mammals which have been examined. (Auth. mod.)

B-44974

Bonner, W.N., **Natural history of seals**, New York, Facts on File, 1990, 196p., Refs. p.181-191.

DLC QL737.P64B66 1990

The work is a general account of the seals of the world including those inhabiting the antarctic and subantarctic waters and ice floes. The opening chapter describes the seals' physical adaptations to cold water environments and compares them to other mammals. Ensuing chapters deal with feeding and diving; reproduction and growth; breeding patterns and social organization; diversity, classification, and origin of seals; three chapters on interactions with Man; and conservation and seals.

B-44983

Cota, G.F., Sullivan, C.W., **Photoadaptation, growth and production of bottom ice algae in the antarctic, Journal of phycology**, 1990 26(3), p.399-411, Refs. p.410-411.

Biomass, chemical composition, growth rates and the photosynthetic response of natural populations of sea ice algae in McMurdo Sound were followed over most of the spring bloom to examine temporal variability under a relatively constant incident irradiance. Collections were restricted to the bottom 20 cm of the ice sheet in an area with little or no snow (0-5 cm). At low temperature and irradiance these algae normally exhibited low assimilation numbers. Average growth rates, based on changes in standing stocks, were also low. Biomass, biochemical composition, growth rates, assimilation numbers and photosynthetic efficiencies displayed large fluctuations over periods of several days during the growth season. On the other hand, photoadaptation, and photosynthesis were relatively constant with less than twofold variation throughout the study. Substantial nutrient fluxes were necessary to satisfy the minimum nutrient demand for the observed biomass levels and population growth rates. Only 5-25% of the total demand could be met by all of the nutrients in the ice sheet, if they were readily available. However, adequate amounts were present in the top few meters of the water column. (Auth. mod.)

B-44985

Schatt, P., Féral, J.P., **Brooding cycle of *Abatus cordatus* (Echinodermata: Spatangoida) at Kerguelen Islands, Polar biology**, Sep. 1991 11(5), p.283-292, Refs. p.291-292.

The Schizasteridae includes a high proportion of brooding species. The brooding cycle of *Abatus cordatus* (a species endemic to Kerguelen) at an intertidal site in one bay is annual and lasts 8.5 months, from the end of Mar. until the beginning of Dec. This cycle is reproducible among years. It is synchronous inside the bay between two intertidal sites. A displacement of about six months occurs at a deeper site (-50 m). The delay of the cycle and depth does not seem to be related because an open-sea intertidal site has a similar displacement of the brooding cycle. It depends on the gonadal cycle which itself depends on the availability of trophic resources. On this basis and from samples taken in Jan., annual brooding cycles are hypothesized to occur in 3 antarctic species of Schizasteridae from the Adélie Coast in relation to the annual sea ice cover and restricted summer period of primary production. (Auth.)

B-44986

Nöthig, E.M., Von Bodungen, B., Sui, Q.B., **Phyto- and protozooplankton biomass during austral summer in surface waters of the Weddell Sea and vicinity, Polar biology**, Sep. 1991 11(5), p.293-304, Refs. p.303-304.

Phyto- and protozooplankton were sampled in the upper 10 m of the water column from Jan. 6 to Feb. 20, 1985 in the eastern Bransfield Strait vicinity and in the Weddell Sea. The plankton assemblages are discussed in relation to physical, chemical and biological factors in the different geographical areas in summer. Phytoplankton biomass (Phytoplankton carbon, PPC) ranged from 4-194 micrograms carbon/l and consisted on average of 65% diatoms and 35% autotrophic flagellates. In general, autotrophic flagellates and small pennate diatoms dominated at oceanic stations; in neritic areas large centric diatoms prevailed. Chlorophyll *a* concentrations ranged from 0.25-3.14 micrograms chl *a*/l. Protozooplankton biomass (Protozooplankton carbon, PZC) ranged from 0-67 micrograms carbon/l and consisted of 49% ciliates, 49% heterotrophic dinoflagellates and 2% tintinnids. Protozooplankton amounted to 25% on an average of the combined biomass of PPC plus PZC for the entire investigation period. Protozoan biomass in the southeastern and southern Weddell Sea occasionally exceeded phytoplankton biomass. Temperature, salinity and inorganic nutrients were generally lower in the southern regions; at most of these stations a meltwater layer occurred in the upper meters of the water column. It is suggested that this physical regime allows a well-developed summer system with a high proportion of heterotrophic microplankton. In the eastern Bransfield Strait, in

the northern Weddell Sea and close to the coast off Vestkapp, however, early summer conditions occurred with less protozooplankton contribution. (Auth. mod.)

B-44987

Plötz, J., Weidel, H., Bersch, M., **Winter aggregations of marine mammals and birds in the northeastern Weddell Sea pack ice**, *Polar biology*, Sep. 1991 11(5), p.305-309, 14 refs.

A seabird and mammal census was carried out in the northeastern Weddell Sea during the winter of 1986. The German research ice-breaker *Polarstern* operated in heavy pack ice along the Greenwich Meridian between the northern sea ice boundary and the antarctic coast. Crabeater seals (*Lobodon carcinophagus*), minke whales (*Balaenoptera acutorostrata*), Adélie penguins (*Pygoscelis adeliae*), antarctic petrels (*Thalassoica antarctica*) and snow petrels (*Pagodroma nivea*) were found to be more abundant in the vicinity of the submarine Maud Rise, about 700 km north of the continental margin, than in other areas of substantial ice cover traversed during that cruise. The aggregations of birds and mammals are expected to reflect aggregations of their principal food, krill wintering underneath the ice cover. The distribution pattern of krill predators coincides with the course of a warm water belt upwelling near Maud Rise. This upwelling could induce local ice melting which in turn may result in an increased release of sea ice algae. (Auth.)

B-44988

Shimada, K., Ohyama, Y., Pan, C.X., **Cold-hardiness of the antarctic winged midge *Parochlus steinenii* during the active season at King George Island**, *Polar biology*, Sep. 1991 11(5), p.311-314, 9 refs.

The winged midge *Parochlus steinenii* (Diptera:Chironomidae) and its immatures were collected from freshwater lakes near the Great Wall Station during Jan. and Feb. in 1990. They were examined for supercooling ability and lower lethal temperature. They were all intolerant to freezing. Supercooling points (spontaneous freezing points) of the larvae, pupae and adults were -7.4, -16.3 and -15.3 C, respectively. These values represented the potential limits of cold-hardiness of this species. But the median lower lethal temperatures examined under an aqueous condition were always higher than the corresponding mean supercooling points. Half of the larvae, pupae and adults in the aqueous condition were killed at about -3, -9 and -7 C, respectively, probably due to inoculative freezing. These temperatures seemed to be the natural lower limits of survival in the immatures and some adults of this species, at least in the active season. (Auth.)

B-44989

Jacques, G., Panouse, M., **Biomass and composition of size fractionated phytoplankton in the Weddell-Scotia Confluence area**, *Polar biology*, Sep. 1991 11(5), p.315-328, Refs. p.327-328.

The measurement of Chl *a*, Chl *b* and Chl *c* contents in four size fractions together with microscopic examination illustrate the structure and the relative importance of the micro-, nano- and picophytoplankton in the production system in the Weddell/Scotia Confluence area. In the Scotia Sea, large diatoms were prevalent and their biomass increased during the six week cruise period, exceeding 1 mg Chl *a*/cu m at the beginning of Jan. In contrast, in the Marginal Ice Zone of the Weddell Sea, the biomass remained low, up to 0.3 mg Chl *a*/cu m. A diversified nanoplankton community accounted for more than 90% of this biomass: small diatoms, naked dinoflagellates, cryptophytes, prymnesiophytes and green flagellates which increased the Chl *b*/Chl *a* ratio to values >0.20. An important trend affected the Confluence area, where a high biomass net-plankton community (4 mg Chl *a*/cu m) rapidly changed towards a uniform nano-

plankton system of the same kind as in the Weddell Sea. (Auth. mod.)

B-44990

Thomas, D.N., Wiencke, C., **Photosynthesis, dark respiration and light independent carbon fixation of endemic antarctic macroalgae**, *Polar biology*, Sep. 1991 11(5), p.329-337, Refs. p.336-337.

The light saturated photosynthesis, dark respiration and light independent carbon fixation of macroalgal species endemic to the Antarctic were measured. Five brown algae, *Ascoseira mirabilis*, *Desmaretia anceps*, *D. antarctica*, *Phaeurus antarcticus*, *Himantothallus grandifolius* and the red alga *Palmaria decipiens* were included. Rates of these three parameters at 0 C were very similar to those measured in other studies on temperate algae at higher temperature. This indicates a high degree of physiological adaptation to the antarctic environment within these species. A comparison was made of polarographic and chemical means of measuring oxygen flux during photosynthesis and dark respiration at low temperature. There was a good correlation between measurements of oxygen evolution and carbon fixation, although apparent photosynthetic quotient values were in most cases high. (Auth.)

B-44991

Gilbert, N.S., **Primary production by benthic microalgae in nearshore marine sediments of Signy Island, Antarctica**, *Polar biology*, Sep. 1991 11(5), p.339-346, Refs. p.345-346.

During the summer of 1987/1988, three 24 h in situ primary productivity measurements were made at a nearshore sublittoral site on the east coast of Signy I. The first experiment in Dec. coincided with the peak of the benthic algal bloom, as shown by benthic chlorophyll measurements and a primary productivity rate of 700.9 mg carbon/sq m/d. In Jan., the experiment was undertaken during the peak of the phytoplankton bloom when light intensities reaching the benthos were greatly reduced; the productivity rate was reduced by half. In Mar. the phytoplankton bloom had died off, benthic light intensities had increased and production increased also. The experiments indicate changes in benthic microalgal activity during the summer, linked to changes in the benthic light climate. Compared with previous measurements of phytoplankton activity at Signy, the microphytobenthos seems to be an important source of primary production. (Auth. mod.)

B-45006

Fenner, J.M., **Late Pliocene-Quaternary quantitative diatom stratigraphy in the Atlantic sector of the southern ocean**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.97-121, 42 refs.

DLC QE39.T49b Vol.114 1987

The practically continuous, paleomagnetically dated late Gauss-Brunhes sediment profiles of ODP Sites 699 and 701, south of the present Polar Front Zone (PFZ), and Site 704, north of the present PFZ, are used for a high-resolution study of abundance fluctuations of eight stratigraphic marker species in space and time. Ecological restrictions and preferences of eight diatoms are deduced. The ages of their first abundant appearance datums (FAAD), last-appearance datums (LAD), and last abundant appearance datums (LAAD) at the three sites are determined. The interpolated datum ages agree relatively well with those determined by other authors, if one interprets most of their LADs as LAADs. FAADs and LAADs produce more accurate datums than LADs. For the late Matuyama (younger than approximately 2.0 Ma), when PFZ fluctuations affected all three sites, the datum ages determined agree within the methodically caused limits of accuracy for each datum. For the early Matuyama (older than approximately 2.0 Ma) the results can be interpreted as either

that the ages of the FAAD of *T. kolbei* and LAAD of *T. vulnifica* datums determined at Sites 699 and 701 are more reliable or that these datums are diachronous between these two sites and Site 704. Such a diachroneity could be caused by different paleoceanographic conditions (stable subantarctic conditions over Site 704 and stable antarctic conditions over Sites 699 and 701). A few taxonomic changes were necessary. One new genus is defined (*Simonseniella* gen. nov.) and five new combinations are proposed. (Auth.)

B-45007

Fenner, J.M., **Taxonomy, stratigraphy, and paleoceanographic implications of Paleocene diatoms**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.123-154, 84 refs.

DLC QE39.T49b Vol.114 1987

The taxonomy and stratigraphy of pelagic Paleocene diatoms from ODP Sites 698, 700, and 702 and DSDP Site 524 in the South Atlantic and DSDP Site 214 in the Indian Ocean are presented, as well as paleogeographic and paleoecologic implications. Eleven new species and one new variety are described and one new combination is proposed. Hole 700B provides one of the most continuous diatomaceous Paleocene profiles known. Stratigraphic ranges of diatom species from this and other Southern Hemisphere sites are calibrated against calcareous microfossil zones. The first-appearance datums of *Triceratium gombosii*, *Hemiaulus incurvus*, and *Triceratium mirabile* in Paleocene deep-sea sediments are useful for regional stratigraphic correlations. Quantitative analysis of the biosiliceous microfossil groups (diatoms, silicoflagellates, radiolarians, and archaemonadaceae) shows that preservation of diatoms is confined primarily to the upper Paleocene (planktonic foraminifer Zones P3 and P4 and calcareous nannofossil Zones upper NP5 to lower NP9). In the lower Paleocene only short intervals in Hole 700B are diatomaceous. Any correlation between the degree of silica diagenesis and the calcium carbonate content of the sediment is not obvious. Diatom species analysis reflects changes in the paleoenvironment between island-related upwelling conditions with highly diverse and well-preserved diatom assemblages and less productive periods resulting in less well-preserved diatom assemblages with a higher content of robust neritic diatoms. (Auth. mod.)

B-45046

Brey, T., Gutt, J., **Genus *Sterechinus* (Echinodermata: Echinoidea) on the Weddell Sea shelf and slope (Antarctica): distribution, abundance and biomass**, *Polar biology*, Aug. 1991 11(4), p.227-232, 18 refs.

Two species of the echinoid genus *Sterechinus* were documented from 92 trawl stations and 55 photographic stations in the eastern and southern Weddell Sea between 100 and 1200 m water depth. Two species occurred along the whole shelf and slope, *S. neumayeri* being more abundant above 450 m water depth and *S. antarcticus* dominating the deeper regions. The size-frequency distributions of both species indicate differences in growth, mortality and longevity. First estimates of abundance and biomass of *S. neumayeri* and *S. antarcticus* are 0.085 ind/sq m & 0.005 gAFDW/sq m and 0.022 ind/sq m & 0.005 gAFDW/sq m, respectively. (Auth.)

B-45047

Bech, C., Mehlum, F., Haftorn, S., **Thermoregulatory abilities in chicks of the Antarctic Petrel (*Thalassoica antarctica*)**, *Polar biology*, Aug. 1991 11(4), p.233-238, Refs. p.237-238.

The thermoregulatory capacity of Antarctic Petrel chicks, *Thalassoica antarctica*, breeding in a large colony in Queen Maud Land, was studied. Compared to newly hatched chicks of other birds, those of the Antarctic Petrel are characterized by a relatively high standard

metabolic rate (SMR) and thermal conductance. Their metabolic scope is limited, however, being only 1.6 times the SMR, and they consequently depend on parental brooding to maintain Tb. At an age of 11 days the chicks become thermally independent and are left alone in the nest. The chicks keep a relatively high body temperature (>6 C) throughout their early development and no indication was found that they normally experience hypothermia. A significant positive relationship between latitude of breeding and SMR of the hatchlings is shown to exist for procellariiform birds. It is suggested that the high SMR found in Antarctic Petrel hatchlings could be a prerequisite for achieving a high growth rate, rather than being of any thermoregulatory significance. (Auth.)

B-45048

Riebesell, U., Schloss, I., Smetacek, V., **Aggregation of algae released from melting sea ice: implications for seeding and sedimentation**, *Polar biology*, Aug. 1991 11(4), p.239-248, Refs. p.247-248.

Factors influencing the fate of ice algae released from melting sea ice were studied during a RV *Polarstern* cruise to the northwestern Weddell Sea. The large-scale phytoplankton distribution patterns across the receding ice edge and small-scale profiling of the water column adjacent to melting ice floes indicated marked patchiness on both scales. The contribution of typical ice algae to the phytoplankton was not significant. In experiments simulating the conditions during sea ice melting, ice algae revealed a strong propensity to form aggregates. Differences in the aggregation potential were found for algal assemblages collected from the ice interior and the infiltration layer. Aggregates were of a characteristic structure, consisting of monospecific microaggregates which are likely to have formed in the minute brine pockets and channels within the ice. Sinking rates of aggregates were three orders of magnitude higher than those of dispersed ice algae. These observations, combined with the negligible seeding effect of ice algae found during this study, suggest that ice algae released from the melting sea ice are subject to rapid sedimentation. (Auth. mod.)

B-45049

Ernst, W., Klages, M., **Bioconcentration and biotransformation of C-14-gamma-hexachlorocyclohexane and C-14-hexachlorobenzene in the antarctic amphipod *Orchomene plebs* (Hurley, 1965)**, *Polar biology*, Aug. 1991 11(4), p.249-252, 23 refs.

Experiments were carried out on the bioconcentration and biotransformation of C-14-hexachlorocyclohexane and C-14-hexachlorobenzene in the necrophagous antarctic amphipod *Orchomene plebs* kept alive in the laboratory on shipboard. A bioconcentration factor (BCF) of 28,400 for gamma-HCH related to the lipid content has been found in *O. plebs* which is similar to factors found in invertebrates of temperate latitudes of boreal regions. A BCF for C-14-HCB could not be determined because of incomplete dissolution of the compound under experimental conditions. Up to 5% of both compounds were transformed to more polar products which were not identified further. The effects of pollution in Antarctica are briefly discussed. (Auth.)

B-45050

Pütz, K., Plötz, J., **Moulting starvation in emperor penguin (*Aptenodytes forsteri*) chicks**, *Polar biology*, Aug. 1991 11(4), p.253-258, Refs. p.257-258.

The moult fast in emperor penguin (*Aptenodytes forsteri*) chicks was studied during Jan. 1990 at Drescher Inlet, eastern Weddell Sea. In early Jan. feeding of the chicks had stopped and about 4,000-5,000 chicks were in the inlet. The number of starving chicks decreased rapidly until Jan. 26 when all chicks had either left the inlet or died. Mean body mass loss of starving chicks was 257 g/day and the eva-

luated specific daily mass loss was 25 g/kg body mass. The critical body mass, i.e. the mass below which chicks die during moulting starvation, was estimated to be 4 kg. Mean body mass was higher and mass loss lower in chicks at more advanced moult stages. Chicks left the inlet before moult was completed, although the sea-ice was still stable. (Auth.)

B-45051

Boyd, I.L., Arnbom, T., **Diving behaviour in relation to water temperature in the southern elephant seal: foraging implications**, *Polar biology*, Aug. 1991 11(4), p.259-266, Refs. p.265-266.

A time-depth-temperature recorder provided a continuous record of diving of a female southern elephant seal in relation to water temperature for 27 days (1939 dives) after completion of moult. Mean maximum dive depth was 391 m and the overall maximum was 775 m. Dives lasted on average 17.5 min. Most dives showed a rapid descent to the discontinuity between the cold surface water and warmer deep water. Consequently the seal spent 57% of its time while diving at a depth of 200-400 m when it may have been foraging. This strongly suggests that the seal was exploiting a food source at the discontinuity between vertically stratified water masses. The water temperature data also indicated that the seal was diving in waters south of the Antarctic Polar Front and at some distance from the northern edge of the pack ice. The seal spent 88% of its time under water. Normal surface intervals between dives lasted an average of 2.1 min whereas 16 extended surface intervals (> 10 min duration) lasted 32.7 min. Dives were deeper during the day than at night, and all but one extended surface interval occurred at night. (Auth. mod.)

B-45052

Shivaji, S., **Identification of *Janthinobacterium lividum* from the soils of the islands of Scotia Ridge and from Antarctic Peninsula**, *Polar biology*, Aug. 1991 11(4), p.267-271, Refs. p.270-271.

Eight isolates of bacteria from the soils of maritime Antarctica and Antarctic Peninsula have been identified as members of the genus *Janthinobacterium*. Based on their morphology, physiological characteristics, biochemical characteristics and mole percent G+C content of their DNA, six of them have been identified as *J. lividum* and the remaining two as *atypical J. lividum*. The antarctic *J. lividum*, unlike the mesophilic type strains, were unique in that they could grow at pH4, could produce acid from trehalose and none of them could tolerate more than 2.9% NaCl. (Auth.)

B-45053

Piatkowski, U., Rodhouse, P.G., Duhamel, G., **Occurrence of the cephalopod *Martialia hyadesi* (Teuthoidea: Ommastrephidae) at the Kerguelen Islands in the Indian Ocean sector of the southern ocean**, *Polar biology*, Aug. 1991 11(4), p.273-275, 17 refs.

In view of the ecological importance of *M. hyadesi* to antarctic predators, and the likelihood that it will be commercially exploited in the future, it is important to thoroughly establish its geographical range, and in particular to confirm its circumpolar distribution. The capture of a specimen of *M. hyadesi* at the Kerguelen Is. seems to confirm the circumpolar distribution of this species, linking its known occurrence in the southwest Atlantic sector and the western Pacific sector. It is suggested that the specimen was probably caught in the close vicinity of its spawning ground which may be associated with islands or sea mounts.

B-45054

Culik, B.M., **Pygoscelid penguins in a swim canal**, *Polar biology*, Aug. 1991 11(4), p.277-282, 37 refs.

The authors investigated the energy consumption of Adélie, Gentoo and Chinstrap penguins when resting in the water (8.4 W/kg) and

swimming underwater at various speeds, using a 21 m long canal filled with sea water at 4 C in conjunction with respirometry. The birds swam at will and consumed 15.7, 16.1 and 10 W/kg at the speed where cost of transport was minimal (2.1, 2.3 and 2.5 m/s in Adélie, Gentoo and Chinstrap penguins, respectively). Thermal conductance in pygoscelid penguins was 3.3W/degC/sq m and energy expenditure (P_i , W/kg) while resting in the water is given by $P_i = -0.3 t_a + 9.6$, where t_a is water temperature in deg C. During the breeding season, pygoscelid penguins spend 25-40% of their daily energy expenditure while foraging at sea. The importance of accurate estimates of at-sea activity and energy consumption is discussed. (Auth.)

See also:

A-43479 A-43691 A-44832 A-44845 D-43452 E-42948
E-42991 E-43040 E-43047 E-43300 E-43671 E-43673 E-43674
E-43729 E-43750 E-43955 E-44048 E-44142 E-44143 E-44144
E-44249 E-44259 E-44264 E-44376 E-44389 E-44390 E-44391
E-44392 E-44393 E-44488 E-44489 E-44490 E-44491 E-44492
E-44498 E-44499 E-44500 E-44501 E-44502 E-44505 E-44509
E-44510 E-44511 E-44518 E-44521 E-44522 E-44540 E-44620
E-44633 E-44635 E-44663 E-44665 E-44666 E-44711 E-44712
E-44789 E-44859 E-44898 E-44930 E-44939 E-45010 E-45011
E-45012 E-45013 E-45014 E-45016 E-45017 E-45018 E-45019
E-45028 E-45032 E-45038 F-43130 F-43886 F-43888 F-44432
F-44572 F-44854 F-44992 I-43214 I-43280 I-43558 J-42953
J-43135 J-43136 J-43137 J-43171 J-43197 J-43198 J-43217
J-43483 J-43604 J-43649 J-43692 J-43763 J-43825 J-43890
J-43918 J-44135 J-44324 J-44377 J-44378 J-44387 J-44493
J-44494 J-44495 J-44496 J-44497 J-44504 J-44506 J-44507
J-44642 J-44656 J-44725 J-44727 J-44732 J-44868 J-44869
J-44870 J-44871 J-44946 J-44950 J-44952 J-44953 J-44954
J-44955 J-45026

C. CARTOGRAPHY

C-43078

Herzfeld, U.C., Holmlund, P., **Geostatistical analyses of radio-echo data from Scharffenbergbotnen, Dronning Maud Land, East Antarctica**, *Zeitschrift für Gletscherkunde und Glazialgeologie*, 1988 24(2), p.95-110, With German summary. 23 refs.

This paper is concerned with the evaluation and interpretation of radio-echo data by means of geostatistical methods in order to investigate the following parameters: topography of bedrock surface beneath the glacier, ice thickness, and direction of recent ice flow and ice flow during former glacial maxima. Relations between structural data analysis and glaciological, geological, and morphological observations are described. The resultant maps of ice thickness and subglacial morphology are presented. Data were sampled on Scharffenbergbotnen, Dronning Maud Land, East Antarctica, in the glaciological part of the Swedish Antarctic Research Program (SWEDARP) during the German Antarctic Expedition VI/3 1987/88. The valley is found to be deep and U-shaped and is oriented perpendicular to the predominant trend of the main geological strata. A shallow overdeepening is observed in the innermost part of the valley floor. The maximum ice thickness is approximately 1050 m. (Auth.)

C-43113

Whillans, I.M., **Study of ice streams B and C, Antarctic** *journal of the United States*, 1989 24(5), p.78-79, 3 refs.

The ice streams draining the inland ice of West Antarctica are dramatic features. They are as long as the state of Ohio, 1,000 m thick, and 50 to 100 km wide, and they exhibit speeds reaching 2.5 m per day. A major portion of the Siple Coast Project is the mapping of ice streams B and C and the determination of their surface velocity pattern and mass balance. This involves the use of doppler satellite (TRANSIT) receivers and high-elevation aerial photography. The TRANSIT receivers are left to record for 24 hours at each station in each of 2 years. The first velocity determinations are used to describe the pattern of flow and compute mass balance. Repeated surveys of the position of the Upstream B camp show no time changes in velocity. TRANSIT surveying can provide positions and velocities only of crevasse-free areas where airplane landings are possible. Much of ice stream B is heavily crevassed and airplane landings would be unwise and surface travel arduous and dangerous. The crevasses, however, can be turned to an advantage with the use of repeat photogrammetry.

C-43186

Sievers, J., Grindel, A., Meier, W., **Digital large-block mosaic of LANDSAT-MSS imagery of Antarctica** [Digitales Mosaik eines grossen Blocks von Landsat-MSS-Satellitenbilddaten der Antarktis], *Bildmessung und Luftbildwesen*, Sep. 1989 57(5), p.175-182, In German with English and French summaries. 8 refs.

It is current practice to use geodetic control for the rectification and absolute orientation of digitally recorded satellite image data. In Antarctica, this control regularly can be represented by isolated mountain peaks (nunataks) or other stationary topographic features. However, normally ground control is insufficient. Fixed points are often determined in various independent coordinate systems. Vast areas containing no control at all have to be bridged, and points are often moving or changing. A method is herein outlined with which, in general, it will be possible to overcome the above mentioned problems and which is based only on digital processing. Described is a

project in which 74 LANDSAT-5 and four LANDSAT-1 MSS scenes, mainly covering the regions of Filchner-Ronne Ice Shelf and Coats Land (Antarctica), are treated in an overall block adjustment. In that area, extending over about 1500 km by 200 km, geodetic control was only available for some 30 fixed points. (Auth. mod.)

C-43334

Starr, L.E., Brownworth, F.S., **Antarctic mapping program**, *Antarctic journal of the United States*, 1989 24(5), p.278-279.

During the 1988-1989 antarctic research season, the U.S. antarctic mapping program undertook a diversity of projects: 1:250,000-scale satellite image mapping; 1:250,000-scale reconnaissance mapping; 1:1,000,000-scale mapping on the IMW format; 1:50,000-scale topographic mapping; doppler satellite and geodetic control field surveys; gravity data acquisition; aerial photography; Scientific Committee on Antarctic Research (SCAR) Library for Geodesy and Geographic Information operations; and South Pole Station mapping needs. A brief statement is given of the progress made in these areas.

C-43363

Shum, C.K., **Variations of global mesoscale eddy energy observed from Geosat**, *Journal of geophysical research*, Oct. 15, 1990 95(C10), p.17,865-17,876, 22 refs.

Geosat altimeter data from forty-four 17-day repeat cycles (2 years) were processed into sea surface slopes along the satellite ground track, averaged, and filtered to produce a mean sea surface slope profile having an estimated accuracy of 0.2 microrad (2 cm sea level change over 100 km distance). A series of global eddy kinetic energy maps, each averaged over 3 months, and their mean were then generated. The maximum mean eddy kinetic energy per unit mass exceeds 2000 sq cm/sec/sec for most of the western boundary currents; however, it only reaches approximately 500 sq cm/sec/sec for the Antarctic Circumpolar Current (ACC). More than 65% of the world ocean has relatively low variability, with an eddy kinetic energy of less than 300 sq cm/sec/sec. Results obtained from this study are in general agreement with other Geosat ocean variability studies. However, significantly higher variability is found when compared with either Seasat or ship drift data. Significant seasonal variations were found in the Gulf Stream and Kuroshio currents. The ACC system exhibits no apparent seasonal variation. (Auth.)

C-43364

Chelton, D.B., Schlax, M.G., Witter, D.L., Richman, J.G., **Geosat altimeter observations of the surface circulation of the southern ocean**, *Journal of geophysical research*, Oct. 15, 1990 95(C10), p.17,877-17,903, 52 refs.

The variability of sea level and surface geostrophic currents in the southern ocean is investigated from the first 26 months of unclassified Geosat altimeter data (Nov. 1986 to Dec. 1988). Because of problems unique to Geosat, it has been necessary to develop new techniques for analyzing the height data. These techniques are presented here, and the processed Geosat data are used to examine the relation between mesoscale variability and the mean circulation (as determined from historical hydrographic data). The two are significantly correlated, implicating the importance of hydrodynamic instabilities in the Antarctic Circumpolar Current. Geographical patterns of both the mean flow and the mesoscale variability are controlled by the bathymetry. An efficient objective analysis algorithm is introduced for generating smoothed fields from observations randomly distributed in time and two space dimensions. The algorithm is applied to the

26 months of Geosat data, and the smoothed fields are used to investigate the large-scale, low-frequency variability of sea level and surface geostrophic velocity in the southern ocean. Approximately 33% of the variance is accounted for by the first three empirical orthogonal functions (EOFs) of sea level variability. These three modes describe variability over seasonal time scales, and separate into an annual cycle (mode 1), a semiannual cycle (mode 2) and a mode which describes year-to-year variability in the seasonal cycles for 1987 and 1988 (mode 3). (Auth. mod.)

C-43372

Sudakov, A.S., **Current cartographic investigations in Antarctica** [Sovremennaya kartograficheskaya izuchennost' Antarktity], *Geodeziya i kartografiya*, Dec. 1989 No.12, p.30-34, In Russian.

A review is presented of contributions by the international community to cartographic research in Antarctica, including name of country, areas mapped and the maps' scale, during the 30 years of the Antarctic Treaty's existence. Four illustrations showing the data discussed accompany the text.

C-43380

Rothery, D.A., Francis, P.W., Cover. **Short wavelength infrared images for volcano monitoring**, *International journal of remote sensing*, Oct. 1990 11(10), p.1665-1667, 6 refs.

To illustrate the utility of infrared imagery as a volcano monitoring tool, the journal cover image of Mount Erebus is described and the color pattern is interpreted. The potential for infrared monitoring of this and other volcanoes on a continuing basis by future spaceborne mounted scanners is emphasized.

C-43650

Avérous, P., **Geomorphological maps of Saint Paul and Amsterdam Islands** [Réalisation de cartes géomorphologiques des îles Saint Paul et Amsterdam], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Apr. 1990 No.86-04, p.27-39, In French.

Bathymetric, positional and geomorphological data on the submarine and terrestrial characteristics of Saint Paul and Amsterdam Islands are presented, and details of the mapping operation are given. The new map of Saint Paul I. covers an ocean area of 2400 sq km, from the coast to 1500 m in depth. The Amsterdam I. map covers an area of 1300 sq km, from the coast to 200 m in depth.

C-43683

Xu, S., **Establishment of surveying systems of the Great Wall Station**, *Antarctic research*, Dec. 1990 1(1), p.49-57, 6 refs.

A description is given of a complete and accurate surveying system, established in the Great Wall Station area, which includes geodetic coordinate system, an elevation system and a gravity reference system. The surveying methods and the mathematical models for establishing these systems are discussed, and the accuracy of results is analyzed. (Auth. mod.)

C-43724

Partington, K.C., Cudlip, W., Rapley, C.G., **Assessment of the capability of the satellite radar altimeter for measuring ice sheet topographic change**, *International journal of remote sensing*, Mar. 1991 12(3), p.585-609, 42 refs.

The potential of the satellite radar altimeter to monitor surface topography of ice sheets is examined in detail, using Seasat and Geo-

sat altimeter data recorded over the Wilkes plateau in East Antarctica. Range measurement precision is optimized by the use of an improved retracking technique. However, tilt and bias orbit adjustment techniques are shown to leave errors in the measurement of surface elevation change. Additional orbit error, which cannot be identified from crossover residuals, is almost certainly present in the difference measurements. Variable mispointing of the Geosat antenna is considered the most likely explanation for an apparent change in surface scattering properties which results in errors in the measurement of elevation differences. As a result of these two uncorrected sources of error remaining in the data, the best estimate for surface elevation change between 1978 and 1985, along a narrow strip 2748 km long at 72S, is +1.05 m, which includes correction for a -22 cm systematic bias in the Geosat range measurements. The results have implications for altimeter measurements of surface elevation change over all land surfaces, and indicate that much further research needs to be carried out to make full use of data from ERS-1 and subsequent satellites. (Auth. mod.)

C-43765

Shibuya, K., Fukuda, Y., Michida, Y., **Application of GPS relative positioning for height determination above sea level in the antarctic marginal ice zone**, *Journal of physics of the Earth*, 1990 38(2), p.149-162, 10 refs.

GPS relative positioning was made at Breid Bay for determining height above sea level on the marginal ice sheet (L0 point). Two GPS receiver systems were installed at L0 point and on the deck of the icebreaker *Shirase* (S point). A water-level recorder was installed at the anchoring site of *Shirase*, and sea level variation was monitored for 4 days. The combined accuracy of height determination of L0 point above sea level can thus be considered as ± 0.3 m. Overall accuracy may further be degraded to ± 0.5 m uncertainty from the effect of possible local gravity anomalies between L0 point and S point of 30 km distance. This error budget is allowable for the starting experiment of installation of a height datum station in the marginal ice zone of Antarctica. The method applied in this experiment cannot give exact orthometric height, but can effectively be extended to the "GPS traverse leveling" to the inland outcrop area of Antarctica.

C-43813

Thomas, R.H., **Polar research from satellites**, Washington, D.C., Joint Oceanographic Institutions, Inc., [1991], 91p., Refs. p.65-69.

This report presents a review of existing and planned satellite sensors with applications to polar research, a description of the major sets of polar data already acquired by satellites, and a preview of planned missions that will both extend these data sets into the future and provide entirely new types of polar data. In addition, it includes some examples of how these various data should be used to address specific problems. Emphasis is on instruments that measure surface, or near-surface parameters of particular importance to polar research. A summary is provided of major polar-research objectives in order to help identify the types of satellite measurement that can be used to address these objectives. It represents an attempt to identify a set of polar research objectives that contribute to larger studies of the global system, with a clear bias towards research that can benefit significantly from satellite measurements.

C-43835

Zwally, H.J., Major, J.A., Brenner, A.C., Bindaschadler, R.A., Martin, T.V., **Satellite radar altimetry over ice. Volume 2: User's guide for Greenland elevation data from Seasat**, U.S. National Aeronautics and Space Administration. Reference publication, Jan. 1990 NASA-RP-1233-Vol.2, 82p., N90-20563, 12 refs.

A gridded surface-elevation data set and a geo-referenced data base for the Seasat radar altimeter data over Antarctica are described.

It is intended to be a user's guide to accompany the data provided to data centers and other users. The grid points are on a polar stereographic projection with a nominal spacing of 20 km. The gridded elevations are derived from the elevation data in the geo-referenced data base by a weighted fitting of a surface in the neighborhood of each grid point. The gridded elevations are useful for creating smaller-scale contour maps, and examining individual elevation measurements in specific geographic areas. Tape formats are described, and a FORTRAN program for reading the data tape is listed and provided on the tape. (Auth.)

C-43971

Spiridonov, I.U.G., Milekhin, O.E., Popov, V.I., Sizenova, E.A., **Creating a computer radar map of Antarctica** [Avtomatizirovannoe postroenie radiolokatsionnoï karty Antarktidy], *Leningrad. Gosudarstvennyi nauchno-issledovatel'skii tsentr izucheniia prirodnkh resursov. Trudy*, 1989 Vol.33, p.126-134, In Russian. 4 refs.

The first variant of a digital radar map, compiled from data obtained by Kosmos-1500, is discussed and illustrated. The method used in the process is described, and a preliminary feature analysis of the map is presented. Values of specific active area of scattering for 7 different antarctic regions are shown in a table.

C-44084

Eiken, T., Luktvasslimo, B.Å., Lytskjold, B., **Geodetic measurements in Dronning Maud Land, Norsk Polarinstitut. Meddelelser**, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.101-111, 1 ref.

The geodetic/topographic program of the NARE 1989/90 expedition had five main objectives: first, to extend the precise trigonometric network measured during NARE 1984/85 to the west, establishing a network of points measured with high accuracy in the H.U. Sverdrupfjella area. If possible, similar measurements should be carried out eastwards from Svarthamaren. Second, to measure points identifiable in satellite images or pictures. The points should be used as fixed points in satellite image rectification or for compilation of maps based on satellite pictures/images. Third, to measure a stake network established by the glaciological group on the Fimbulisen ice-shelf to determine the velocity and strain in the ice. The network should be measured twice, as early and as late in the season as possible. Fourth, to measure a detailed triangulation net in Jutulssessen with enough control points to map the area at a scale of 1:50,000; and fifth, to take oblique photographs from helicopter to cover Jutulssessen with photographs for map compilation at a scale of 1:50,000. Preliminary results achieved in this program are presented.

C-44423

Harris, C.M., **Antarctic Digital Database Project: a new tool for antarctic environmental science and management**, *Polar record*, July 1991 27(162), p.260-261, 3 refs.

Antarctic science and management require up-to-date geographic maps as a basis for analyzing and displaying a wide variety of environmental data. The Antarctic Digital Database Project (ADDP), which was officially launched at the Royal Geographical Society in London on May 9, 1991, aims to provide a single, comprehensive geographic framework of the antarctic continent and its surrounding islands, stored in digital form on CD-ROM. The database is intended to be available by the end of the year.

C-44667

Zibordi, G., Meloni, G.P., **Classification of antarctic surfaces using AVHRR data: a multispectral approach**, *Antarctic science*, Sep. 1991 3(3), p.333-338, 27 refs.

The mapping of sea, land ice, sea ice and clouds from Advanced Very High Resolution Radiometer (AVHRR) images taken over Antarctica in daylight is investigated and a classification scheme is proposed on the basis of thresholds retrieved from multispectral patterns of representative data. The scheme, which can be used for real time analysis of AVHRR images in scientific and logistic activities, gives satisfactory separation of different categories. Major misclassification occurs between ice clouds and land ice because of their very similar spectral signatures in the AVHRR channels. Comparison of classified samples, obtained from visual inspection of images and from application of the scheme, exhibits a confusion matrix with accuracy A=92% over areas almost free from ice clouds. (Auth.)

C-44715

Kämpf, H., Stackebrandt, W., Hahne, K., Pilarski, J., **Thematic aerial interpretations of a mountain region in central Queen Maud Land, East Antarctica** [Thematische Luftbildinterpretationen einer alpinen Region im Zentralen Dronning-Maud-Land, Ostantarktika], *Zeitschrift für geologische Wissenschaften*, 1991 19(4), p.423-431, In German with English summary. 18 refs.

Areal photographs from Wohlthat Massif were carried out and proved by field checking. The area under investigation was the region of the Untersee-Oasis (northern part of Eliseev Anorthosite Massif); coordinates: 71.3-71.4S and 13.2-13.8E. The results deal with the layering and fracture tectonics and the characterization of the moraines. (Auth.)

C-44759

Chen, C.M., E, D.C., Xu, S.Q., **Data processing and accuracy analysis of satellite Doppler positioning of Great Wall Station, Antarctica**, *Antarctic research*, 1990 2(4), p.57-63, In Chinese with English summary. 4 refs.

The data processing of satellite Doppler positioning of the Great Wall Station region is described. Analysis of the results of pre-processing, receiver drift, point positioning and translocation, the convergence of solutions and the errors of broadcast ephemeris, lead to the conclusion that satellite Doppler positioning is very useful in geodetic positioning and monitoring glacier motion in Antarctica. (Auth. mod.)

C-44772

Remy, F., Minster, J.F., **Comparison between active and passive microwave measurements of the antarctic ice sheet and their association with the surface katabatic winds**, *Journal of glaciology*, 1991 37(125), p.3-10, 20 refs.

The intensity of the Seasat altimeter return power over Antarctica varies in strong correlation with the intensity of model katabatic winds. It is also strongly correlated with the polarization of the passive microwave signal at 37 GHz of the Nimbus-7 SMMR data. It is shown that this is most likely the result of the wind-induced micro-roughness of the ice surface. (Auth.)

See also:

E-43091 E-44904 F-42900 F-43163 F-43517 F-43568 F-43730
F-44200 F-44281 F-44298 F-44356 F-44581 F-44761 F-44762
F-44775 F-44973 G-43820 J-43391 L-43295 L-43415 L-43662
L-43818 L-44134

D. EXPEDITIONS

D-43107

Miller, H., ed, Oerter, H., ed, **Expedition ANTARKTIS-V of RV *Polarstern* 1986/87; report of legs ANT-V/4-5** [Die Expedition ANTARKTIS-V mit FS *Polarstern* 1986/87; Bericht von den Fahrtabschnitten ANT-V/4-5], *Berichte zur Polarforschung*, 1990 No.57, 207p. (pertinent p.1-126), In German with English summary. Refs. passim.

During ANT V/4 a number of landbased as well as marine research programs were carried out in the southern Weddell Sea. Furthermore it was necessary to resupply the winter-over base Georg von Neumayer. In particular the following research projects were pursued during this expedition: marine-geophysical investigations of the structure of the sedimentary sequences at the continental rise and on the shelf; marine geological investigations of sedimentary processes and palaeoclimate; oceanographic and hydrochemical studies on the formation and distribution of antarctic bottom waters; biological programs entailing metabolism studies on marine organisms kept under controlled conditions and sampling of benthos were continued from the previous cruise leg; glaciological, geodetic and geophysical studies on the Ekström Ice Shelf; areal photogrammetry for the study of present ice shelf edge position as well as selected areas within Ritscher Highland. (Auth.)

D-43374

Harrowfield, D.L., **Mules of the British Antarctic Expedition 1910-13**, *Polar record*, Jan. 1991 27(160), p.23-28, 12 refs.

Horses were first used in Antarctica when eight Manchurian ponies provided support for Shackleton's British Antarctic Expedition (1907-09). Scott's British Antarctic 'Terra Nova' Expedition (1910-13) used 17 ponies during its first year, and seven Indian mules in the following season. This paper presents new information on the mules, which suffered severely from the effects of an unbalanced diet and low temperatures. They were the last horses ever used to support an antarctic expedition. In Jan. 1989 when the stables of Scott's hut at Cape Evans were re-clad and cleared of ice by a working party from the Antarctic Heritage Trust (New Zealand Antarctic Research Programme), artefacts relating to their occupancy by Manchurian ponies and Indian mules were located. (Auth.)

D-43452

Arntz, W., ed, Ernst, W., ed, Hempel, I., ed, **Expedition ANT VII/4 (EPOS leg 3) and VII/5 of RV *Polarstern* in 1989**, *Berichte zur Polarforschung*, 1990 No.68, 214p. (pertinent p.1-173).

The principal objective of EPOS leg 3 was the extension of knowledge on the high antarctic ecosystem by means of an integrated study of benthos and fish communities in relation to biotic and abiotic environmental conditions. This included: a detailed study of the macrobenthos, benthic meiofauna, pelagic and demersal fish communities related to depth, oceanographic conditions, and sediment properties; a study of the ecology, including bathymetric distribution, reproduction and feeding of selected groups of benthic organisms, paying special attention to amphipods, caridean shrimps, molluscs, sponges, harpacticoids, and fish; chromosome morphology (karyology) and enzyme polymorphism studies, to provide information relevant to population dynamics, taxonomy and phylogeny of fish; physiological investigations on selected species to study adaptations of organisms to particular features on the high Antarctic, such as

extremely low temperatures and short production periods; a study of the vertical distribution, and the C and N metabolism, of water column phyto- and zooplankton, bacteria and suspended matter in relation to hydrography, depth and sediment conditions at the seafloor. The original idea of an integrated study of the (presumably) richest of the benthic communities, the Eastern Shelf Community, at a single site was replaced by a comparison of two, possibly different, communities on the southeastern Weddell Sea shelf and slope, Halley Bay and Cape Norvegia. As many samples as possible were taken from different compartments of the ecosystem (oceanographic data, water samples, plankton/fish/benthos samples of all size fractions, sediment samples), at the same time from the same stations, in order to interrelate the various results later on.

D-43782

Roland, N.W., ed, **German Antarctic North Victoria Land Expedition 1982/83 GANOVEX III, Vol.1, *Geologisches Jahrbuch, Reihe B***, 1984 No.60, 396p., For individual reports see D-43783, E-43784, E-43786 through E-43800, and L-43785.

The major effort of GANOVEX III is centered on that part of East Antarctica lying at about 72S 165E, inland from the Cape Adare-Cape Hallet region, where these geographic formations are located: the Bowers and Victory Mountains, Lanterman and Mountaineer Ranges, and Rennick, Aviator, and Mariner Glaciers, in addition to many other landscape features. The 18 papers included in this volume deal with the geology of the region, emphasizing the structural, stratigraphical, and petrological aspects as well as some of the mineralogical, volcanological, sedimentary, geomagnetic, and historical components of note.

D-43783

Kothe, J., **Expedition and its logistics, *Geologisches Jahrbuch, Reihe B***, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.9-29, With German and Russian summaries.

Following a safety training course at Mount Cook in the Southern Alps of New Zealand, the German Antarctic North Victoria Land Expedition III left Wellington on board the ice breaker *Polar Queen* on Dec. 4, 1982. After a one-week voyage approximately along 180 longitude with good weather and ice conditions, the field work began at Cape Adare and the Lillie Marleen Hut reopened, near the Lillie Glacier, in study area A. Field work was carried out in this area until the middle of Jan. The ship was then taken around Cape Adare to 74 deg 38'S on the Ross Sea at Gerlache Inlet, Terra Nova Bay, to set up the Gondwana summer station and a large fuel depot. While the scientists were working in study area B, a construction troop finished Gondwana station. Later, the ship returned to pick them up. The scientific work in work area B had to be discontinued due to bad weather. After personnel, rock samples, and equipment were reloaded in stages as the weather permitted, the ship was moved to study area C. Once there, unfavorable pack ice conditions and renewed bad weather in the unprotected sea prevented work, and thus the expedition was ended at the end of Feb. (Auth.)

D-44070

Orheim, O., ed, **Report of the Norwegian Antarctic Research Expedition, Norsk Polarinstitutt. Meddelelser**, Dec. 1990 No.113, 144p., Refs. passim. For individual papers see A-44073, B-44074 through B-44078, B-44087, C-44084, E-44083, F-44080 through F-44082, G-44071, G-44072, H-44085, J-44079, J-44086 and J-44088.

This report describes the research conducted on the Norwegian Antarctic Research Expedition (NARE), 1989/90. The expedition involved 34 scientists working in Antarctica during Jan. and Feb. 1990, and the report contains 18 contributions from 33 authors. They generally contain sections on background, objectives, field work and preliminary results. The report first gives a broad account of the expedition and the building of the station *Troll*, followed by an account of the industrial archaeology and biology research at South Georgia. The next section covers ornithologic, invertebrate, topographic-geodetic, and geologic work done by a 19-person group at *Troll* and in the region of Gjelsvikfjella and Mühlig-Hofmannfjella, and glaciological work done at Fimbulisen. The last part of the report describes the oceanographic, marine biological, and marine geological research done from the expedition vessel K/V *Andenes*, in the central and southern parts of the Weddell Sea. (Auth.)

German public and the Government of the German Empire which involved the selling of the first German polar research vessel. (Auth.)

See also:

A-44199 A-44863 E-43407

D-44218

Murphy, J.E., **South to the pole by ski**, Saint Paul, MN, Marlor Press, 1990, 202p.

DLC G850 1988.M87 1990

This personal account of a one-of-a-kind journey tells of the trials and tribulations associated with mounting and accomplishing a private expedition to Antarctica. The ski concept was broached by a travel agency announcing that it was recruiting interested persons to make a ski trek to the South Pole, a journey made only twice previously, never by an American and never by a woman. This ski traverse included two women among the nine skiers who were able to raise the funds required of each participant. The \$70,000 per person fee included all of the equipment, food, transportation, lodgings, and planning and training costs needed for the 45 days of skiing from the SW edge of the Ronne Ice Shelf to the Pole, approximately 750 miles, averaging about 17 miles per day. It was a strong test of determination, adaptability, and strength for the entire team.

D-44928

Lüdecke, C., **Consequences of route decisions taken for the First German South Polar Expedition under the influence of Georg von Neumayer** [Die Routenfestlegung der ersten deutschen Südpolarexpedition durch Georg von Neumayer und ihre Auswirkung], *Polarforschung*, 1989(Pub. 1991) 59(3), p.103-111, In German with English summary. 40 refs.

At the beginning of this century, Antarctica, except for some sightings of land, was more or less a *terra incognita* which was still to be investigated. In Germany, south polar research was propagated above all by Georg von Neumayer. As the *Gazelle* Expedition to measure the transit of Venus in front of the sun was to be sent out to Kerguelen in 1874, Neumayer made use of this for his own plans. He proposed a preliminary expedition to Kerguelen to be followed by some advances to the south. After the return of the *Gazelle*, Neumayer adhered to his plan to investigate the south following the route passing Kerguelen and based this upon meteorological and oceanographical facts. So this route became obligatory for Erich von Drygalski, leader of the first German South Polar Expedition (*Gauss* Expedition 1901-1903). Because of the decision to follow this route, Drygalski could not advance southwards as far as the English expedition under the leadership of Robert Falcon Scott at the same time. The consequence was a contempt for the *Gauss* Expedition by the

E. GEOLOGICAL SCIENCES

E-42896

Naraoka, H., Yanai, K., Fujita, S., **Report on antarctic meteorites search around the Sör Rondane Mountains, JARE-29 1988-1989**, *Antarctic record*, July 1990 34(2), p.216-224, In Japanese with English summary. 10 refs.

A systematic search for meteorites was carried out by the Asuka winter party of the 29th Japanese Antarctic Research Expedition on the bare ice field around the Sör Rondane Mountains in the 1987-1988 and 1988-1989 field seasons. More than 2000 meteorite specimens as individuals or fragments were collected; their total weight is over 400 kg. The collection, which will be named officially Asuka-87 and Asuka-88 meteorites, consists of various types of meteorites, such as irons, stony-irons, chondrites, achondrites and carbonaceous chondrites, including some unique specimens. The largest specimen in this collection is a 46 kg LL type ordinary chondrite. (Auth.)

E-42946

Chaar, E., **Study on surface layer sediments of antarctic sea bottom** [Estudio de sedimentos de superficie de fondo marino de un sector antártico], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.370, 8p., In Spanish with English, French and German summaries. 5 refs.

Results obtained from analysis of sea floor samples of sediments near Marambio, Jubany and San Martín Stations are reported. The work consisted of granulometric and mineralogical studies of the clay fraction by diffraction of X-rays. Montmorillonite, a mineral that is scarce in Jubany and is lacking in San Martín, was found in the neighborhood of Marambio. (Auth. mod.)

E-42947

Lirio, J.M., Marensi, S.A., Santillana, S.N., Marshall, P.A., Rinaldi, C.A., **Marambio Group at the southeastern part of James Ross Island, Antarctica**, *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.371, 46p., Refs. p.23-27.

A new lithostratigraphic unit is defined for the Marambio Group (Cretaceous-Lower Tertiary). The new sedimentary unit, which is proposed to be named Rabot Formation, had formerly been included in the López de Bertodano Formation or in the Santa Marta Formation, although its lithological features are different. The Rabot Formation is stratigraphically below the López de Bertodano Formation and is partially contemporaneous with the Santa Marta Formation. The type section outcrops between Hobbs Glacier and Rabot Point with a minimum thickness of 435 m, without base or roof exposures. It is divided in 3 informal members and is made up of friable pelites, silty sandstone and scarce conglomerates. This sequence is represented by a homocline structure. A Late (Early?) Campanian age is assigned because of the abundance of marine invertebrate fauna, especially by the presence of *Metaplacenticeras* sp. and *Hoplitoplacenticeras* sp. (Auth. mod.)

E-42948

Martínez Macchiavello, J.C., **Cenozoic diatoms from the central oceanic Atlantic-Indian Ridge** [Diatomeas Cenozoicas del sudoeste de la dorsal media oceanica Atlantico-Indica], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1988 No.364, 67p., In Spanish with English, German and French summaries. Refs. p.41-55.

Results of research on diatom biostratigraphy of two cores obtained northeast of the Weddell Sea basin are presented. Lithologic analysis shows a silicious slime with a mixture of diatoms and radiolaria and a biogenetic excess in SiO₂ of about 30% reaching sometimes up to 60%; its texture and color are homogeneous. The age was determined on the basis of diatomic biostratigraphical zonations. The following zonations were recorded: for core 1: *Denticulopsis hustedtii*/*Denticulopsis lauta*, Middle to Late Miocene up to *Coscinodiscus lentiginosus*, Pleistocene; and for core 2: *Coscinodiscus elliptipora*/*Actinocyclus ingens*, Pleistocene up to *Coscinodiscus lentiginosus* Pleistocene. (Auth. mod.)

E-42973

Bardin, V.I., **Antarctic lakes: paleoglacial aspects of study**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.63-67.

Present antarctic periglacial regions are characterized by such severe natural conditions that at first sight the mere fact of existence of long-term amount of water seems anomalous. The mean temperature for the so-called antarctic oases, or ice-free zones, is -10 C to -20 C. The recent periglacial zone of the Antarctic, with lakes as its integral part, is the heritage of the last stages of the antarctic glaciers retreat. This process led to the exposure of the territory of the antarctic oases and perhaps to the formation of the most part of the water basins. Geological studies of the lake sediments can provide valuable glaciological information giving the exact date of the glacial retreat. The study of 30 thousand year old bottom sediments showed that comparatively warm intervals were repeatedly changed by cold ones. These warm periods were characterized by flooding of the territory, cold periods by an increase of dryness and development of eolian processes. In all, there were 4 warm periods and 4 cold periods.

E-42975

Zhang, Q., **Comparison of periglacial landforms between the Vestfold Hills, East Antarctica and the Fildes Peninsula of King George Island, West Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.74-81, 9 refs.

A comparison of main features between antarctic continental and maritime periglacial landforms is discussed, based on several years of work carried out in the Vestfold Hills. The yearly freeze thaw cycles, as a most important index to control periglacial processes, are described. (Auth. mod.)

E-42976

Cui, Z., Xie, Y., Liu, G., **Antarctic periglacial environment and the formation mechanism of "sorted circles" in the Fildes Peninsula**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.82-90.

In the Great Wall Station area, the annual average temperature is -2.2 C, the annual precipitation is 612.4 mm, and the active layer is 0.40-1.20 m thick. According to the periglacial-geomorphological development and distributional characteristics, the Fildes Peninsula and its adjacent islands may be divided into periglacial-geomorphological areas at different levels of development. This paper summarizes the developmental process and mechanism of polygon or sorted circles, and reviews the general features of the periglacial-geomorphological development in this area.

E-42977

Li, H., Wang, S., **Characteristics of crustal movement and evolution in the Transantarctic Mountains and Ross Island region, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.90-97, 15 refs.

The Chinese summer expeditions to Antarctica during 1981-1982 and 1983-1984 carried out geological field investigations in the Dry Valley and Ross I. areas. A total of 87 representative samples were collected, of which 29 were paleomagnetically oriented hand samples, including those of basement metamorphic rocks, covering sedimentary rocks, intrusive and volcanic rocks, and Quaternary sediments. Based on the data obtained, the characteristics of crustal movement and evolution in the area studied are summarized as follows: two great structural units can be distinguished, the basement and the covering strata. The drift of the antarctic continent and extensive intrusion and extrusion of basic magmas during the Meso- and Cenozoic eras provide a clear indication that the crustal movement possesses a unique temporal sequence and unique tectonic features.

E-42978

Xie, G., **Petrology and geochemistry of cenozoic volcanic rocks, Ross Island and Transantarctic Mountains**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.97-102, 17 refs.

Cenozoic volcanic rocks collected from 5 localities from Ross I. and the Transantarctic Mountains have been studied with respect to their petrology, mineralogy, geochronology, isotopic and trace element geochemistry, high-pressure melting and inclusions. The lavas studied can be divided into trachyphonolite and tephrite-basanite, and a co-magmatic evolution, controlled mainly by fractional crystallization at deep magma chamber, has been established between them. It has been shown that the lavas resulted from intraplate volcanism in the Pliocene (4.4-5.0 Ma) and the Quaternary (<1 Ma), with the trachyphonolites as the latest eruptive products. Pb and Sr isotopic data indicate that the mantle source is similar to that of island basalts in the Southern Hemisphere. The low Th/U ratio of the lavas also indicates a depleted mantle source. (Auth. mod.)

E-42979

Taylor, T.N., **Fossil fungi of Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.103-108, 24 refs.

The fossil record is a long neglected source of valuable information concerning the diversity, structure, evolution and biologic activities of ancient fungi. Two localities of Permian and Triassic age in Antarctica have provided a wealth of information about fossil fungi. The specimens are preserved as permineralizations so that details about the structure of the organisms can be determined. In this paper several types of fossil fungi are discussed including: wood-rotting forms, endomycorrhizae, a clamp-bearing basidiomycete and several forms believed to be members of the Endogonaceae. A specimen demonstrating the interaction between a fungus and arthropod is also noted. (Auth.)

E-42980

Taylor, E.L., **Tree-ring structure in woody axes from the central Transantarctic Mountains, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.109-113, 17 refs.

A collection of permineralized wood from the Early-Middle Triassic of the central Transantarctic Mountains was examined for features associated with paleoclimate interpretation. The wood occurs within a permineralized peat deposit in the Fremouw Formation (Beacon Supergroup). Secondary xylem is dense with distinct growth rings. Growth rings were measured to ascertain variation in width from year to year. Earlywood/latewood boundaries were determined, and changes in radial cell diameter throughout each ring were analyzed according to the techniques developed for Cretaceous and Tertiary woods. The Triassic wood from Antarctica corresponds most closely to a type that generally occurs where the growing season is relatively uniform, but with a marked cessation of cambial activity at the end of the season. Factors that may have contributed to this growth pattern are discussed in light of the current knowledge of the megaflores from this site. (Auth.)

E-42981

Li, Z., Liu, X., Zhen, X., Jin, Q., Li, G., **Tertiary volcanism and formation of volcanic rocks in the Fildes Peninsula, King George Island, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.114-119, 8 refs.

From 1985 to 1987 the Chinese National Antarctic Research Expedition prepared a geological map of the Fildes Peninsula on a scale of 1:15000, measured corresponding stratigraphic sections, and systematically collected various specimens and samples in the area. It is found that tertiary volcanism in the area generated a subalkaline volcanic rock series consisting mainly of basaltic, basaltic-andesitic and andesitic rocks with small amounts of dacitic rocks. Paleovolcanism involves 3 phases, which are described. The age of the volcanic rocks is determined as 135-105 Ma in the southwest of the Peninsula, 96-72 Ma in the central region and 65-25 Ma in the northwest.

E-42982

Shen, Y., **Recent advances in research on the palaeontology of the Fildes Peninsula, King George Island, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.119-127, 38 refs.

Over 200 fossil specimens were collected at 11 localities of the Fildes Peninsula. At Half Three Point, spore pollen, fungal spores and leaf remains were discovered from sedimentary intercalation within volcanic rocks. The palynomorph assemblage indicates a late Cretaceous age and comprises both cosmopolitan taxa and endemic elements of the Southern Hemisphere and Antarctica in contents. The plant-bearing beds probably represent marsh-lacustrine deposit under low energy and reducing conditions. A biota of Eocene Fossil Hill Formation was mainly collected from Fossil Hill and Rocky Cove. It includes abundant well-preserved sporopollen, fungal spores, leaves, wood, bird footprints and trace fossils. Fossil-bearing grey tuffaceous siltstones with mud-cracks, wave ripples and rain prints probably represent shallow lacustrine deposit near the sea coast. The flora group shows that the deposition of the plant beds occurred in a humid, warm, subtropical rain-forest environment. (Auth.)

E-42983

Li, H., Shen, Y., **Primary study of Eocene flora from the Fildes Peninsula of King George Island, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.128-135, 25 refs.

The fossil plants studied were collected by the Chinese expedition to Fildes Peninsula during the 1986-1987 and 1987-1988 seasons. Plant taxonomy and foliar physiognomy, and a stratigraphic cross section of the Fossil Hill, are discussed. A description of several species most frequently found in the area is presented. It is concluded that the floras from Rocky Cove and Fossil Hill most likely represent a subtropical rain forest and are probably of Eocene age.

E-42984

Askin, R.A., **Late Cretaceous-Early Paleocene palynology of Seymour Island, Antarctica: a summary**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.136-142, Refs. p.140-142.

Abundant, well-preserved palynomorphs are preserved in late Campanian to early Paleocene shallow marine to deltaic sediments of the Lopez de Bertodano and Sobral Formations on Seymour I. The Cretaceous nearshore marine dinoflagellate cyst assemblages are characterized by species of *Manumiella* and related genera. At the end of the Cretaceous the *Manumiella* association was replaced by more varied dinoflagellate cyst assemblages reflecting changing deltaic depositional conditions. The associated nonmarine palynomorphs include spores and pollen transported from the adjacent land area. Podocarpaceous conifer pollen, and particularly *Phyllociadidites*, *mawsonii* dominate the nonmarine palynofloras from the Campanian through the Paleocene. Varied angiosperm pollen reflect a gradually changing land flora from Cretaceous into the Paleocene. The flora includes a marked endemic component, but overall is similar to Cretaceous/Tertiary floras of New Zealand, southeastern Australia and southern South America. The nonmarine palynofloras indicate humid and cool to warm temperate paleoclimates. (Auth. mod.)

E-42985

Zheng, X., Liu, X., **Petrological characteristics and evolution of Tertiary volcanic rocks in the Fildes Peninsula, King George Island, South Shetland Islands, West Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.142-151, 12 refs.

Cenozoic volcanic rocks in the Fildes Peninsula can be divided into 2 litho-stratigraphic formations (4 members). A lava of island-arc calcalkaline series evolves from high-A1 basalt, basaltic andesite to andesite and dacite. It is demonstrated that the evolution of magma, from primitive Mg-rich olivine tholeiite to dacite, is dominated by fractional crystallization. Two-fold magmatic evolution history is recognized. A mantle-derived magma, which is related to the subduction of the Pacific Plate, remained at a lower crust with the fractionation of olivine, clinopyroxene and plagioclase. The fractional crystallization of plagioclase and clinopyroxene is considered a principal evolution from high-A1 basaltic through andesitic to dacitic magma. (Auth.)

E-42986

Cao, L., **Late Cretaceous sporopollen flora from Half Three Point on Fildes Peninsula of King George Island, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.151-156, 14 refs.

Results of a study of 8 palyniferous samples from the volcanic sedimentary rock series in the Half Three Point area on Fildes Penin-

sula are discussed. Lithologically, the rock series represents gray tuffaceous siltstone. A careful treatment of the samples revealed relatively abundant sporopollen fossils in 4 samples. Although only a small part of the fossil assemblage is available for identification, it contains some genera and species which are of significance to the determination of stratigraphical ages, sedimentary environments, paleogeography and paleoclimate. It is concluded that it seems to be suitable to regard the palyniferous rocks at Half Three Point as of Late Cretaceous age.

E-42987

Jin, Q., Shun, N., Kuang, F., **Mineralogical characteristics of island arc volcanic rocks from Fildes Peninsula, King George Island, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.157-167, 4 refs.

Mineralogical characteristics of rock-forming minerals occurring in the Tertiary volcanic rocks on Fildes Peninsula are discussed. Two groups of pyroxene, the Ca-depleted and the Ca-enriched, are described. A close relationship between the chemical evolution of the pyroxene and their host magmas is established. Thermodynamic calculations suggest that the equilibrium crystallizing temperature and pressure are 1053-1150 C and 0.25-1.03 GPa, respectively. Plagioclase phenocrysts in the rocks are mainly bytownite and labradorite. The chemical evolution of plagioclase phenocrysts is consistent with that of their host magma. Total REE of different samples of the same mineral is different, but is positively correlated with that of their host rocks. Olivine phenocrysts are mainly chrysolite. Almost all the olivine phenocryst was altered entirely into iddingsite and serpentine and occurred in the form of pseudomorph. (Auth. mod.)

E-42989

Xie, Y., Yang, S., Chen, B., Yang, Y., Guan, P., **Geochemistry of sediments in Xihu Lake of Great Wall Station of China, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.176-186, 4 refs.

Tabulated contents of the chemical elements in the clay and silt sediments of Xihu Lake are presented, along with a description of the method of analysis used. The relationship between the sediments and the volcanic rocks is discussed. It is found that the elements have not been differentiated strongly enough and have the characteristics of the mother rocks. It is concluded that the element differentiation is affected by the cold climate; this is reflected in the distribution of some elements in the lake's sediments.

E-42990

Zheng, L., Lin, D., Feng, Y., **Modern sedimentation in the northwestern waters of the Antarctic Peninsula**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.187-197, 20 refs.

Most of the surficial sediments of the northwestern waters of the Antarctic Peninsula fall into two distinct groups: residual glacial marine sediments which consist mainly of relict glacial debris delivered into the sea floor by glacier during the glacial advances, and are restricted to the continental shelf; and compound glacial marine sediments, which are mainly composed of current-derived fine materials and ice-rafted detritus, and occur in the bays, glacial troughs and deep basins as well as on the continental slope. In the study area, ice-rafted debris decrease markedly in abundance from the continental shelf to continental slope. Biogenous materials in the sediments occur commonly in the bays, deep glacial troughs and deep basins. Volcanic materials and turbidite deposits play an important role in influencing the surficial deposits of the deep basin in the eastern part of the Bransfield Strait. (Auth. mod.)

E-42991

Zhao, J., **Preliminary exploration of the environmental background values of the Fildes Peninsula area of King George Island, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.198-207, 5 refs.

The paper presents the preliminary exploration of the main chemical composition and method of physical and chemical analysis of essential elements of the environments: rock, sedentary soil (mantle), sediments, atmospheric rainfall, underground water, aerosol, and the biological sphere on King George I. Results are applicable to the study of the law of the migration and translation of the chemical elements in the development and utilization of resources in the Antarctic in the future. (Auth. mod.)

E-42992

Zhao, J., **Studies on environmental evolution in the area of Fildes Peninsula, King George Island, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.207-214, 7 refs.

The method to study modern environmental evolution through biogeochemical indicator elements is presented. On the premise that environmental information is effectively recorded in residual plants in sediments, a 3 m long sediment core and samples of growing moss were obtained at the bottom of Xihu Lake near the Great Wall Station. Annual average changes of precipitation for about 4000 years were reconstructed, and the latest deglaciation of the ice sheet from this area is estimated to have occurred 3500 years ago.

E-42995

Roland, N.W., **Evidence for moving the boundary of the East Antarctic Craton**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.233-241, 27 refs.

The boundary of the East Antarctic Craton was formerly located at the rim of the Transantarctic Mountains, the formation of which has been assigned to the Ross Orogeny. In northern Victoria Land at the Pacific end of the Transantarctic Mountains new evidence for the positioning of the boundary between shield and Precambrian platform was obtained by aeromagnetic survey in 1984/85. The shield is inferred as beginning west of the Eisenhower Range, whilst the metamorphics of the Precambrian platform extend at least to the Bowers Terrane. It can be shown that a resetting of the radiometric clock of schists and gneisses (probably Precambrian) took place during the Ross Orogeny. At least the highgrade metamorphic Wilson Terrane of northern Victoria Land is considered to represent metasediments of the platform, i.e. polydeformed and polymetamorphic basement rocks. As the boundary of the craton probably runs through the Ross Sea towards the Weddell Sea, it is of interest that new evidence for shifting the craton boundary has also been found in the Weddell Sea area. Hence the Transantarctic Mountains can no longer be regarded as forming the edge of the East Antarctic Craton. (Auth. mod.)

E-43036

Markgraf, V., **Late Pleistocene/Holocene paleoclimates from subantarctic latitudes**, *Antarctic journal of the United States*, 1989 24(5), p.1-2, 6 refs.

Because the climates in subantarctic latitudes are greatly affected by conditions in Antarctica, specifically the drift-ice patterns that in turn alter the latitudinal position and strength of the moisture-bringing southern westerlies, paleoclimatic changes in Tierra del Fuego allow inferences on antarctic paleoclimates. Late Pleistocene climates in the subantarctic latitudes were characterized by over 50% reduction in precipitation, compared to today, suggesting that the storm tracks of the southern westerlies did not affect these latitudes in the same

intensity as today. Early Holocene climates were characterized by higher effective moisture than the late-glacial climates. Compared to the Late Holocene and modern conditions, however, effective moisture during the early Holocene was lower. Judging from a record at latitude 50S which indicates that the westerlies had returned to their modern location by 9,000 years ago, the relatively "drier" climates in the early Holocene in Tierra del Fuego are probably not due to lower precipitation but to warmer temperatures instead. This interpretation could relate to the results from antarctic ice cores that suggest temperature maximum was reached in the early Holocene.

E-43037

Elliot, D.H., Hoffman, S.M., **Geologic studies on Seymour Island**, *Antarctic journal of the United States*, 1989 24(5), p.3-5, 6 refs.

During Jan. and early Feb. 1989 fieldwork was conducted on Seymour I. with the logistical assistance of the Instituto Antartico Argentino. This field program continued the investigation of the stratigraphy, sedimentology, and sedimentary petrology of the Lower Tertiary beds. Detailed work on the dinoflagellate floras across the Cretaceous/Tertiary boundary at the southern end of the island took place in a 6 m-thick glauconite bed that occurs close to the base of Macellari's unit 10 of the Lopez de Bertodano Formation (Macellari 1988). The 6 m-thick glauconite bed and overlying 1 m-thick clay-rich bed were sampled at 10 cm intervals. Two additional sections exposing the Cretaceous/Tertiary boundary, either side of the east-west trending dike that crosses the southern part of the island, were also sampled. Units 1, 2, and 3 of the Sobral Formation just south of the dike were measured and sampled to provide a comparison with the sections measured previously.

E-43038

Zinsmeister, W.J., **Joint Argentine/American expedition to Seymour Island during austral summer, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.6, 7 refs.

During Jan., 1989, four U.S. scientists were invited to participate in an Instituto Argentino Antartico expedition to Seymour I. The specific objective of the field work was to continue ongoing stratigraphic and paleontologic studies on the Cretaceous/Tertiary boundary and the Late Eocene sequence on Seymour I. Three new exceptionally well-exposed sections were discovered. One of these sections was sampled at a 10 cm interval and the other two at a 1 m interval. These samples are now being studied at several institutions. Detailed surface collecting for macrofossils was also done in the Danian part of the Lopez de Bertodano Formation and in the lower part of the overlying Sobral Formation. A relatively diverse fauna of mollusks were recovered. A detailed biostratigraphic and mapping program was carried out of the Cape Wiman region at the northern tip of the island.

E-43039

Upchurch, G.R., Jr., Askin, R.A., **Latest Cretaceous and earliest Tertiary dispersed plant cuticles from Seymour Island**, *Antarctic journal of the United States*, 1989 24(5), p.7-10, 10 refs.

The research reported here constitutes a pilot study of dispersed plant cuticles in nearshore to marginal marine rocks spanning the Cretaceous/Tertiary boundary on Seymour I. This study was initiated to determine the feasibility of studying dispersed plant cuticles in nearshore to marginal marine rocks, and supplement extensive palynological data on floristic change at high southern paleolatitudes with data from leaf remains, which can provide evidence on ecological change independent of inferred modern affinities. Noteworthy is the occurrence of the epiphyllous fungus *Trichopeltinites* in the early Danian of Seymour I., because *Trichopeltinites* becomes extinct at the Cretaceous/Tertiary boundary in the Western Interior of North America. These data are consistent with suggestions that the vegeta-

tion of high southern paleolatitudes was little affected by events at the Cretaceous/Tertiary boundary.

E-43040

Feldmann, R.M., **Eocene decapod crustacean faunas of New Zealand**, *Antarctic journal of the United States*, 1989 24(5), p.10-12, 9 refs.

Recent studies of the Eocene decapod crustaceans of Seymour I. have demonstrated that fossil crabs are abundant and diverse in that region. Furthermore, these studies have shown that decapods were able to inhabit the antarctic region at that time, providing evidence that whatever ecological factors are presently responsible for excluding decapods from the Antarctic were not operative then. Because the Eocene paleogeographic configuration of the Southern Hemisphere was substantially different than it is today, it has been suggested that the resultant paleocurrents may have produced a more highly seasonal climate than currently exists, and that this higher degree of seasonality may have made it possible for a more diverse fauna, including decapods, to have colonized Antarctica. New Zealand occupied a more southerly position during the Eocene than at present, and there is a high probability that there would be some faunal similarity between the Eocene decapod faunas of these two regions. Thus, the purpose of this report is to present preliminary results of fieldwork in New Zealand, which confirm faunal similarities within the Weddellian Province.

E-43041

Krissek, L.A., Horner, T.C., **Geochemical indicators of source lithologies and weathering intensities in fine-grained Permian Clastics, central Transantarctic Mountains**, *Antarctic journal of the United States*, 1989 24(5), p.13-16, 19 refs.

During summer 1985-1986, approximately 310 samples of fine-grained clastics from 24 measured sections in the Permian sequence of the central Transantarctic Mountains were collected. The objective of the field work is to extract provenance and paleoclimatic information from the mineral and chemical compositions of the fine-grained sediments in the Permian section, which records the transition from a glacial regime (Pagoda Formation), through a subaqueous fan/delta setting (Mackellar Formation), to fluvial environments (Fairchild Formation) with coals (Buckley Formation). The southern portion of the study area does not follow the general stratigraphic trend, and contains anomalous Mackellar paleocurrents and mineralogic indicators of weathering conditions, suggesting that it records a transition from the Beardmore portion of the Permian depositional basin to the remainder of the basin to the south and southeast. Preliminary results indicate that the mineral and chemical compositions of fine-grained sediments can provide valuable provenance information in the study of a depositional basin. More detailed examinations of the geochemical data are presently underway.

E-43042

Horner, T.C., Krissek, L.A., **Organic carbon characteristics in the Permian Mackellar Formation, central Transantarctic Mountains**, *Antarctic journal of the United States*, 1989 24(5), p.17-19, 8 refs.

Analysis of 105 samples from the Mackellar Formation yields an average organic carbon content of 0.40%. Localized reductions in this value are due to the presence of intrusive bodies. Organic carbon contents are relatively uniform within most sections, and organic carbon contents show little regional variation, with the exception of the southernmost section. Vitrinite reflectance values help to identify altered samples within the Mackellar Formation, and also establish regional heating patterns in the Beardmore Glacier area. Within the Mackellar Formation, the northern section has the lowest vitrinite reflectance values. The average vitrinite reflectance is highest in the

center of the study area and decreases slightly in the southernmost section. This pattern of heating may have implications that extend beyond the Mackellar Formation. The pattern described in the Mackellar Formation would be consistent with an intrusive event that was located along the continental margin of Antarctica during Jurassic time.

E-43043

Borg, S.G., DePaolo, D.J., Wendlandt, E.D., **Studies of granites and metamorphic rocks, Byrd Glacier area**, *Antarctic journal of the United States*, 1989 24(5), p.19-21, 8 refs.

Geologic mapping and sampling of granite and metamorphic rocks were carried out along the north side of the Byrd Glacier, along the lower Darwin Glacier, and in the Brown Hills during Jan. 1989. In overall character, the metamorphic rocks of the Byrd Glacier area, especially the Horney Formation, resemble the Miller Formation in the Miller Range to the south. The Miller Formation is constrained to be greater than about 1.7 billion years old and has samarium/neodymium model ages of about 2.8 billion years. It is part of the East Antarctic Craton. Isotopic data on granites from the Miller Range and areas to the east suggest that the edge of the Miller Range-type crust is at the Marsh Glacier, immediately east of the Miller Range, and that this type of crust does not extend beneath the region characterized by the Shackleton Limestone. If correlation of the Horney Formation with the Miller Formation is corroborated, and if the edge of the East Antarctic Craton (as represented by Miller Range-type crust) is projected northward parallel to the average structural grain in the Transantarctic Mountains, then a strike-slip fault can be postulated beneath the Byrd Glacier with a minimum of about 125 km of right-lateral offset.

E-43044

Rees, M.N., Duebendorfer, E.M., **Skelton Group, southern Victoria Land**, *Antarctic journal of the United States*, 1989 24(5), p.21-24, 5 refs.

Observation, mapping and collection of rocks from the geologically complex Skelton Group—and from younger, cross-cutting diabase sills and biotite granite plutons in the vicinity of the Skelton Glacier, central Transantarctic Mountains—were carried out during the 1988-1989 season. Lower-Greenschist facies metasedimentary and meta-volcanic rocks dominate the map area; the mapping documents at least 3 phases of deformation (structures produced by 3 events) in the map area, which is divided into 3 domains that differ in style, orientation, and complexity of structure. These are described and illustrated.

E-43045

Taylor, E.L., Taylor, T.N., Isbell, J.L., Cúneo, N.R., **Fossil floras of southern Victoria Land: 1. Aztec Mountain**, *Antarctic journal of the United States*, 1989 24(5), p.24-26, 1 ref.

On Aztec Mountain, fossil plants were collected from 2 distinct horizons. The first horizon occurs in a 0.35 m-thick, carbonaceous shale 146 m above the base of the Weller Coal Measures, which disconformably overlies the Devonian Aztec Siltstone at this site. The second fossil plant horizon occurs within a 0.65 m-carbonaceous shale 156 m above the base of the formation (7 m below the dolerite sill at the summit). The shale is in sharp contact with underlying sandstone and erosional contact with overlying sandstone. The flora of Aztec Mountain includes abundant specimens of the form genera *Glossopteris* and *Gangamopteris*, and overall a high percentage of plant material (more than 70% of the sedimentary surface is covered by plant remains). Although the plants are not preserved *in situ*, it appears that they were not transported far, as judged from the large number of complete or almost-complete leaves that are present.

E-43046

Taylor, E.L., Taylor, T.N., Isbell, J.L., Cúneo, N.R., **Fossil floras of southern Victoria Land: 2. Kennar Valley**, *Antarctic journal of the United States*, 1989 24(5), p.26-28, 3 refs.

During the 1988-1989 field season, fossil plants of Permian age were collected from the central ridge in Kennar Valley. The plants occur in 0.5-m-thick carbonaceous shale 26 m above the base of the Weller Coal Measures which disconformably overlie the Metschel Tillite at this site. The unit is contained within a 4.6-m-thick sequence containing carbonaceous shale, fine- to upper medium-grained sandstone, and coal. The taphoflora is dominated by leaves of *Noeggerathiopsis*. This leaf type has not previously been recorded in Antarctica but is known from Permian rocks elsewhere in Gondwanaland. In the Kennar Valley the plants occur within meandering stream, flood-plain deposits near the base of the formation, which become progressively more isolated from clastic influx with time. These different depositional environments are reflected in the differing composition of the floras.

E-43047

Taylor, T.N., Taylor, E.L., Isbell, J.L., **Glossopterid reproductive organs from Mount Achnar, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.28-30, 7 refs.

This paper describes 24 specimens of reproductive organs attributable to the glossopterid seed ferns. The specimens were collected approximately 50 m above a 70-m-thick sill at the top of a north-extending platform on Mount Achnar (Upper Buckley Formation, Central Transantarctic Mountains) during the 1985-1986 field season. The specimens occur in a lacustrine shale that is regarded as uppermost Permian in age. All of the specimens are ovule (seed) producing organs that are preserved as slightly three-dimensional impressions. Morphologically, the Mount Achnar fossils most closely compare with specimens described under the generic name *Plumsteadia* (Rigby 1963). The discovery of reproductive organs of the *Plumsteadia* type from Mount Achnar expands the geographic range of this reproductive structure.

E-43048

Wilch, T.I., Lux, D.R., McIntosh, W.C., Denton, G.H., **Plio-Pleistocene uplift of the McMurdo Dry Valley sector of the Transantarctic Mountains**, *Antarctic journal of the United States*, 1989 24(5), p.30-33, 13 refs.

Fieldwork in Taylor Valley was carried out during the 1987-1988 and 1988-1989 austral summers as part of an extensive surficial geology mapping program. Two primary objectives were to establish whether the volcanic rocks were erupted subaerially and to determine whether they were *in situ*. Eighteen geographically and/or mineralogically distinct alkalic basalt localities all contained *in situ* outcrops and all were erupted subaerially. Over 80 samples were collected for argon-40/argon-39 isotopic age determinations. Elevation and preliminary argon-40/argon-39 plateau age data from 11 of the 18 volcanic units in middle Taylor Valley are presented in tables, including the maximum uplift rate for each unit. The lowest maximum uplift rate is 137 m per million years since 3 m.y.a. at the Lower Marr site (west side).

E-43049

O'Connell, D.R.H., Von Frese, R.R.B., Paskievitch, J., **Ship-to-shore seismic refraction investigation of the lithospheric structure of the Transantarctic Mountain front**, *Antarctic journal of the United States*, 1989 24(5), p.33-35, 7 refs.

As part of the 1988-1989 German Antarctic Northern Victoria Land Expedition V (GANOVEX V) offshore-onshore seismic retrac-

tion experiment, a seismic recording array was established in the Transantarctic Mountains to record a tuned airgun array operated in the Ross Sea. The objective was to determine the crustal structure of the transition zone between the Transantarctic Mountains and the Ross Sea by recording three onshore-offshore seismic refraction profiles across the Transantarctic Mountains near Terra Nova Bay. A preliminary analysis of the data suggests a gradual crustal thickening transition zone between the Transantarctic Mountains and the Ross Sea. Crustal thickness beneath the western portion of the Transantarctic Mountains near Terra Nova Bay is significantly less than 40 km.

E-43054

Fleming, T.H., Elliot, D.H., Jones, L.M., Bowman, J.R., **Secondary alteration of iron-rich tholeiitic rocks of the Kirkpatrick Basalt, northern Victoria Land**, *Antarctic journal of the United States*, 1989 24(5), p.37-40, 20 refs.

Data from intrusive rocks of the Australian/Antarctic magmatic province, which includes the Ferrar rocks in northern Victoria Land, suggest both strontium and oxygen isotope ratios have been modified by high temperature meteoric hydrothermal systems. Low delta O-18 values which are typically produced by these systems have been reported. The lavas of the Ferrar Group do not show comparable pervasive high-temperature modification, and the inferred low temperature alteration may be largely confined to the fine grained or glassy matrix material. The best approach for reconstructing the original oxygen and strontium isotopic composition of Ferrar magmas may, therefore, be through the analysis of mineral separates from the lavas.

E-43055

Hammer, W.R., **Lystrosaurus Zone (Triassic) vertebrates from the Beardmore Glacier region, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.40-41, 6 refs.

In addition to the new *Cynognathus* Zone (Late Scythian) fossils reported from the Gordon Valley, an abundance of *Lystrosaurus* Zone (Early Scythian) material was collected in the Beardmore Glacier region during the 1985-1986 season. All of this material came from the lower member of the Fremouw Formation rather than the upper member which contains the younger *Cynognathus* Zone fossils. Bone was collected from the lower Fremouw at Willey Point, Lamping Peak, Coalsack Bluff, and Graphite Peak. Fossils were most abundant at Coalsack Bluff and Graphite Peak; the other two sites yielded only four specimens of the nearly 300 that were collected during the season from this level.

E-43056

Grew, E.S., Asami, M., Makimoto, H., **Luminous and manganian titanite from the Sør Rondane Mountains, East Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.42-43, 9 refs.

Titanite (sphene), a calcium-titanium orthosilicate (ideally CaTiSiO_5), is not only a common accessory mineral in calcilicite rocks and hornblende-biotite gneisses but also occurs sparingly in other rock types in the eastern Sør Rondane Mountains. This article concerns titanites analyzed in three rocks collected during JARE-29 in Jan. 1988, consisting of samples 2911A, 2712B, and 2807 (all with prefix EG8801). These particular titanites illustrate the close relationship between compositional variations in titanite and its geochemical environment. Of special interest is the 2807 titanite, one of the most manganiferous reported. In contrast to titanite in the other two samples, the 2807 titanite is noticeably pleochroic in a reddish hue; the relatively high manganese content in the titanite is attributed to the abundance of manganese in the rock itself, which resulted in high manganese contents of the associated minerals.

E-43057

Cassidy, W.A., **Meteorite search at Lewis Cliff ice tongue: systematic recovery program completed**, *Antarctic journal of the United States*, 1989 24(5), p.44.

All meteorites that will be designated "Lewis Cliff," a cumulative record representing field data from 4 years' activity, are listed as follows: ordinary chondrite: 1,874; achondrite: 32; carbonaceous chondrite: 24; stony iron: 2; iron: 0; uncertain: 52; total: 1,984. These data are of limited accuracy, because they report field determinations based on superficial examinations. Since collection, and following closer examination, some specimens have been reclassified and most of those designated "uncertain" have been examined and classified, or found to be terrestrial rocks.

E-43058

Sears, D.W.G., Sears, H., Myers, B.M., **Natural thermoluminescence measurements on meteorites collected on antarctic blue icefields**, *Antarctic journal of the United States*, 1989 24(5), p.45-46, 12 refs.

In a study of natural thermoluminescence levels in 23 antarctic meteorites, it was found that five meteorites with natural thermoluminescence levels of 30,000-80,000 rad had a mean "terrestrial age" (time interval since fall), determined from isotopic studies; of 150,000 \pm 100,000 years. On the other hand, six meteorites with natural thermoluminescence levels of 10,000-30,000 rad had a mean terrestrial age of 400,000 \pm 200,000 years. On the basis of an earlier study, it is suspected that meteorites with natural thermoluminescence levels below 5,000 rad have had their thermoluminescence levels lowered by reheating; e.g., by close passage to the Sun, heating by shock events in space or by heating during atmospheric passage. The natural thermoluminescence was measured for 380 samples, which represent the majority of those collected in the 1985-1986 austral summers. Histograms for some of the data are shown.

E-43059

Fireman, E.L., **Comparison of the uranium-series age of Yamato K-26 ice with those of Allan Hills and Lewis Cliff ice**, *Antarctic journal of the United States*, 1989 24(5), p.47-48, 11 refs.

The physical properties and the chemical compositions of the particulates in the Lewis Cliff and Allan Hills tephra have been studied. The tephra, in the samples with known ages, consists mainly of glass shards. The Yamato glass shards resemble magmas associated with volcanos in the South Sandwich Is. The Lewis Cliff and Allan Hills shards resemble magmas associated with volcanos in the McMurdo group. A table compares the results of measurements in Yamato K-26 ice with those in Allan Hills 85-1 and Lewis Cliff ice. The uranium abundance in Yamato tephra is 0.02 p.p.m., which is 250 times lower than in the Allan Hills 85-1 tephra; nevertheless, the ice is datable by the uranium-series method. The radium-226/thorium-230 age of K-26 ice is approximately 38,000 years old.

E-43060

Fudali, R.F., **Gravity measurements across and between the meteorite-bearing icefields west-southwest of the Allan Hills**, *Antarctic journal of the United States*, 1989 24(5), p.48-50, 4 refs.

The 1983-1984 antarctic search team for meteorites landed at a site north of Griffin Nunatak, from which it journeyed overland to Elephant Moraine to collect meteorites on the blue ice there. Subsequently, it moved overland to the Far Western Icefield, and finally it moved east-northeast to the Allan Hills. Twenty-four topographic and gravity stations were established along this latter traverse and tied into the triangulation and gravity stations on the Main icefield. The survey delineates a rolling surface with a net elevation drop of 135 m between stations 105 and 34, a distance of 55 km. Also surveyed were several stations along a north-south line across the Far Western

Icefield that define an elevation drop of 33 m in 13 km—i.e., about the same average rate of decline from south to north as from west to east. There are nonquantitative slope estimates suggesting a strong northward component for the ice flow west of the Main Icefield. If so, the partial bedrock barriers beneath the western icefields lie across the ice movement direction, and are truly separate barriers with ice flowing unimpeded between them. Each icefield is a separate meteorite stranding surface. The possibility is suggested of finding only a few rare meteorites, as direct falls, in and on the firn between the blue icefields west of Allan Hills.

E-43062

Lipschutz, M.E., **Meteorite studies: terrestrial and extraterrestrial applications, 1989**, *Antarctic journal of the United States*, 1989 24(5), p.52-53, 8 refs.

Reported here is the use of radiochemical neutron activation analysis and atomic absorption spectroscopy to determine part-per-million to part-per-trillion levels of 12 to 15 trace elements in each sample studied. These elements—antimony, bismuth, cadmium, cesium, cobalt, gallium, gold, indium, rubidium, selenium, silver, tellurium, thallium, uranium, and zinc—are important because of their chalcophile, lithophile, and siderophile geochemistry and especially because most are labile, i.e., highly responsive to thermal processes which usually accompany geochemical or cosmochemical fractionation. Hence, in their absolute contents and relative abundance trends, these elements can record various fractionation events, both preterrestrial and terrestrial, during residence in and/or on the ice sheet. Compositional differences between antarctic and non-antarctic L chondrites are qualitatively consistent with trace-element loss by leaching during residence of the meteorites in and/or on the ice sheet. Differences in shock-loading between the two populations indicate, however, that L chondrites, C chondrites, and eucrites reflect differences in preterrestrial thermal histories, hence genesis, of antarctic and non-antarctic samples.

E-43063

Scherer, R.P., **Microfossil assemblages in "deforming till" from Upstream B, West Antarctica: implications for ice-stream flow models**, *Antarctic journal of the United States*, 1989 24(5), p.54-55, 10 refs.

Sediments underlying grounded ice at the Upstream B camp in central West Antarctica were collected during the 1988-1989 field season. The ice sheet at the drill site is 1,030 m thick and the glacier bed lies 644 m below sea level. About 10 cu cm of sediment was made available for preliminary microfossil study. This paper reports the initial findings of diatom analysis with respect to ice stream flow models. It is suggested that the 600 m, low-sonic-velocity sediment column underlying deforming till at Upstream B is Oligocene and older.

E-43064

Scherer, R.P., **Paleoenvironments of the west antarctic interior: microfossil study of sediments below Upstream B**, *Antarctic journal of the United States*, 1989 24(5), p.56-58, 10 refs.

The following is a brief summary of initial micropaleontologic observations based on study of Upstream B sediments. Diatom fossils of various Cenozoic ages are present, ranging from Late Paleogene to Plio-Pleistocene. Several distinct paleoenvironments are also indicated, including marine, lacustrine, and terrestrial habitats. Several fossil groups have been identified. This research has significant implications for modeling of ice sheets and ice-stream flow. Microfossil assemblages provide a qualitative index of reworking and mixing, and provide evidence for sediment transport and provenance estimates.

E-43065

Marchant, D.R., Lux, D.R., Swisher, C.C., III, Denton, G.H., **Early Pliocene volcanic ash rests on a polar desert pavement**, *Antarctic journal of the United States*, 1989 24(5), p.58-60, 5 refs.

Reconstructions of Pliocene climate based on the ecology of marine diatoms and *Nothogagus* wood of assumed Pliocene age within the Sirius formation suggest extensive ice-sheet collapse accompanied by warm (2-5 C) marine seas in the interior of East Antarctica and the growth of *Nothofagus* in the adjacent Transantarctic Mountains. Reported here is an alternative climate reconstruction based on isotopically dated volcanic deposits that overlie *in situ* polar desert pavements. One such ash deposit of early Pliocene age occurs in Arena Valley, Quartermain Mountains, and is described.

E-43066

Ackert, R.P., Jr., **Origin of isolated gravel ripples in the western Asgard Range, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.60-62, 7 refs.

Preliminary results are presented of a study in Njord Valley, an ice-free, north-facing, hanging valley which overlooks the Dais in upper Wright Valley. Among the features studied were several well-developed fields of isolated gravel ripples. Fieldwork was conducted during the 1983-1986 field seasons. The lack of significant weathering and fresh morphology of the wind ripple on the Dais suggests that it is a relatively recent feature. Ripple formation in Njord Valley likely began with the initiation of weathering of exposed bedrock areas subsequent to the last overriding glacial episode. The thick quartz rinds common on many clasts in the ripples are thought to represent a long weathering history. The fields of isolated gravel ripples are not glacial features. Rather, the ripples are a form of sandstone residuum which has been reworked by wind. The size of the largest clasts inferred to be transported by wind is much larger than previously reported.

E-43067

Fitzpatrick, J.J., Muhs, D.R., **Borax in the supraglacial moraine of the Lewis Cliff, Buckley Island quadrangle—first antarctic occurrence**, *Antarctic journal of the United States*, 1989 24(5), p.63-65, 20 refs.

The borax deposit described in this study is located in the supraglacial moraine at the northeast margin of the Lewis Cliff ice tongue. Pseudomorphs of borax as much as 3 cm in length are found in large blocks, up to 1.4 m on a side. The blocks consist of discrete pods of euhedral borax pseudomorphs in a matrix of clear, euhedral, tabular laths of nahcolite. The most probable origin for this material is considered to have been crystallization from a sub-glacial, alkaline brine generated by the mixing of glacial meltwater with a warm, carbon dioxide-charged, boron-rich thermal fluid.

E-43068

Hagen, E.H., Johnson, K.S., Strobel, M.L., Faure, G., **Iron and titanium anomalies in till from the Transantarctic Mountains**, *Antarctic journal of the United States*, 1989 24(5), p.65-66, 9 refs.

Reported here are preliminary results from a study of the heavy-mineral fraction of till collected at localities ranging from the Morozumi Range of northern Victoria Land to the Wisconsin Range of the Horlick Mountains adjacent to the Reedy Glacier. The concentrations of iron and titanium in 28 of the 30 samples vary within narrow limits; however, a sample of till from the plateau of the Wisconsin Range has significantly higher concentrations of iron and titanium than most of the till samples from the Transantarctic Mountains. In addition, till from Shapeless Mountain is enriched in titanium but depleted in iron relative to the other samples. The heavy mineral

fractions of till in the Wisconsin Range and at Shapeless Mountain appear to have originated from different kinds of rocks under the east antarctic ice sheet.

E-43070

Paul, R.L., Lipschutz, M.E., **Chemical studies of differentiated meteorites: I. Labile trace elements in antarctic and non-antarctic eucrites**, *Geochimica et cosmochimica acta*, Nov. 1990 54(11), p.3185-3196, 66 refs.

Reported here are data for Ag, Au, Bi, Cd, Co, Cs, Ga, In, Rb, Sb, Se, Te, Tl, U, and Zn determined by RNAA in 25 antarctic and 9 non-antarctic eucrites. Compositional variations for a given element in a population range from <10% for Ga to about 200X for Ag, Au, Bi, In, or Tl. Highly incompatible, refractory elements like U are well known to exceed Cl levels in eucrites because of their igneous origin. Surprisingly, contents of highly labile elements can also be quite high, sometimes at 0.1 x Cl, i.e., levels more like chondritic. The U-normalized contents of most elements indicate a thermal (vapor/solid) process accompanied in the case of lithophiles Rb and Cs by a geochemical fractionation. For these, or Ag, Bi, Cd, and Tl, antarctic and non-antarctic non-cumulate eucrites lie on the same trend line, indicating that all derive from the same parent. Antarctic eucrites have different—usually higher—contents of labile elements, particularly Tl, than do non-antarctic eucrites. The difference seems not to be due to the terrestrial history of the samples, but rather is preterrestrial in origin. (Auth. mod.)

E-43075

McClelland, L., et al, **Global volcanism 1975-1985: First decade of reports from the Smithsonian Institution's Scientific Event Alert Network (SEAN)**, Washington, D.C., American Geophysical Union, 1989, p.103-104, 573-580.

The report provides brief essays describing known volcanic eruptions throughout the globe. Data were obtained from personal observations and from satellite monitoring. Antarctic and sub-antarctic volcanic activities reported include those at Heard Island, Marion Island, Mount Erebus, Mount Melbourne, and Seal Nunataks. The report format identifies each site by name, general location, coordinates, elevation of summit, and local time conversion from GMT; gives the date, volume and issue number of the SEAN Bulletin in which the report appeared, as 12.77(2:12) being Volume 2, issue 12, of Dec. 1977; and supplies the narrative account of the event. Added are references and information contacts.

E-43084

Harley, S.L., Hensen, B.J., Sheraton, J.W., **Two-stage decompression in orthopyroxene-sillimanite granulites from Forefinger Point, Enderby Land, Antarctica: implications for the evolution of the Archaean Napier Complex**, *Journal of metamorphic geology*, Nov. 1990 8(6), p.591-613, 68 refs.

Magnesian metapelites of probable Archaean age from Forefinger Point, SW Enderby Land contain very-high-temperature granulite facies mineral assemblages that formed at 10 kbar and 950 C. These assemblages are overprinted by symplectite and corona reaction textures involving sapphirine, orthopyroxene, cordierite and sometimes spinel at the expense of porphyroblastic garnet of earlier orthopyroxene-sillimanite. These textures mainly pre-date the development of coarse biotite at the expense of initial mesophenite, and the subsequent formation of orthopyroxene cordierite-plagioclase rinds on late biotite. The early reaction textures indicate a period of *near-isothermal decompression* at temperatures above 900 C. Decompression from 10 kbar to 7-8 kbar was succeeded by biotite formation at significantly lower temperatures (800-850 C) and further decompression to 4.5 kbar at 700-800 C. The later parts of this P-T evolution can be

ascribed to the overprinting and reworking of the Forefinger Point granulites by the Late-Proterozoic (c. 1000 Ma) Rayner Complex metamorphism, but the age and timing of the early high-temperature decompression is not known. It is speculated that this initial decompression is of Archaean age and therefore records thinning of the crust of the Napier Complex following crustal thickening by tectonic or magmatic mechanisms, and preceding the generally well-preserved post-deformational near-isobaric cooling history of this terrain. (Auth.)

E-43091

Freedman, A.P., Parsons, B., **Geoid anomalies over two South Atlantic fracture zones**, *Earth and planetary science letters*, Oct. 1990 100(1-3), p.18-41, 47 refs.

Seasat altimetry profiles across the Falkland-Agulhas fracture zone (FZ) and the Ascension FZ in the South Atlantic were examined for evidence of step-like geoid offsets predicted from thermal modeling of the lithosphere. The geoid profiles exhibit much short-wavelength power and the step-like offsets are often small, making reliable estimation of the heights of the observed geoid offsets difficult. A preferred offset value was determined for each profile by taking the average of step heights computed with various distances around the fracture zone excluded from the fit. The age of the crust surrounding the fracture zones was determined from surface ship magnetic anomaly data and from existing ocean floor age maps. Observed variations in geoid step height with age of the lithosphere are not consistent with those predicted from standard thermal plate models. For ages less than about 30 Ma, the step offsets across both fracture zones decrease in a manner appropriate for an unusually thin plate with a thickness of 50-75 km. At greater ages, the offsets show complex behavior that may be due to bathymetric features adjacent to the fracture zones. Similar geoid patterns on opposite branches of the Falkland-Agulhas FZ are indicative of processes that act symmetrically on both sides of the Mid-Atlantic Ridge. This behavior of the geoid is consistent both with small-scale convection occurring beneath the lithosphere and with bathymetric features originally produced along the ridge crest and now located symmetrically on opposite sides of the ridge. (Auth. mod.)

E-43092

Gautier, I., Weis, D., Mennessier, J.P., Vidal, P., Giret, A., Loubet, M., **Petrology and geochemistry of the Kerguelen Archipelago basalts (South Indian Ocean): evolution of the mantle sources from ridge to intraplate position**, *Earth and planetary science letters*, Oct. 1990 100(1-3), p.59-76, 67 refs.

Kerguelen basic lavas belong to three magmatic series: transitional, mildly alkaline and highly alkaline, showing from the first to the latter a general increase in alkali and incompatible element contents as well as some of the incompatible trace element ratios, and all ratios involving Th are in the range of those observed for Dupal type OIBs. New Sr, Nd and Pb isotope data strengthen the previously identified Dupal signature of Kerguelen rocks. While the transitional series, older than 26 Ma, shows slightly depleted Sr and Nd isotopic signatures, the alkaline series, between 26 and about 8 Ma, show a slightly enriched signature which is strengthened in the highly alkaline series younger than 12 Ma. Pb isotope ratios do not show any significant difference among these three series. These isotopic data coupled with trace element geochemistry indicate a mixing process between a depleted MORB component and an enriched OIB-type component, the Dupal plume. The Pb isotope characteristics indicate the presence of an old recycled component incorporated into the deep plume source-region. The Kerguelen Is. show a geodynamic evolution from an early ridge centered stage, above or close to the South East Indian Ridge (SEIR) 45 Ma ago, to the present day intraplate setting. The geochemical and isotopic variations reflect this geodynamic evolution, and correspond to variable degrees of mixing between the two extreme components (SEIR, MORB and the Kerguelen plume) whose relative

proportions evolve with the archipelago position, i.e. with the distance from the ridge at the time of eruption. (Auth.)

E-43094

Hagen, E.H., Faure, G., Jones, L.M., **Isotopic studies of calcite, pyrite, and wood from glacial deposits in the Beardmore Glacier area, Transantarctic Mountains**, *Antarctic journal of the United States*, 1989 24(5), p.67-68, 9 refs.

The glacial deposits of the Beardmore area contain unusual constituents including limestone clasts, lacustrine calcite sediment, pyrite, and wood fragments. The isotopic compositions of carbon, oxygen, sulfur, and strontium (as appropriate) of these samples provide information about their origins. Analytical results are shown in a table and interpreted in terms of isotope reference standards PDB (C-13), SMOW (O-18), and TCD (S-34).

E-43099

Bentley, C.R., Anandakrishnan, S., Atre, S., Retzlaff, R., **Geophysical studies at and around Upstream C camp, Siple Coast, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.75-77, 4 refs.

Experiments were designed to investigate the cause and manner of the stagnation of ice stream C, which is inactive. The ice stream once was heavily crevassed at the surface, but now crevasses are buried by 30 m or so, which allowed ground-based seismic and radar sounding, not only on the ice stream but also across the (buried) marginal shear zones ("paleomargins") to the "ridges" on each side. Airborne radar surveys were also conducted by Twin Otter over the upstream portions of ice streams B and C and ridges AB and BC. High-resolution profiling, using 150-gram charges, was carried out along nine line segments on ice stream C and ridge BC to search for subglacial sedimentary layers similar to those beneath ice stream B, and to determine the properties of such layers, if they exist. Wide-angle shooting with charges of 450 grams was carried out to determine the wave velocities in and below the ice. Additional profiles were made with 2.3 kg charges to study the deeper sedimentary layering beneath the ice. All shots were fired in holes about 15 m deep. Additional data were gathered through passive seismic monitoring, a crustal refraction experiment, airborne radar, ground-based 50 MHz radar, and short-pulsed radar.

E-43111

Augustinus, P.C., Selby, M.J., **Rock slope development in McMurdo Oasis, Antarctica, and implications for interpretations of glacial history**, *Geografiska annaler*, 1990 72A(1), p.55-62, 25 refs.

The upper slopes of the Asgard and Olympus ranges of the Transantarctic Mountains have been assessed for their rock mass strength. A finite-element model of two peaks has shown that under gravitational loading they have a tendency to spread laterally as a result of internal stresses. Stress release joints and slab failures are a consequence of this loading. The characteristic slope forms are cliffs in strength equilibrium surmounting Richter denudation-slopes. It is argued that the ubiquity of such forms, and their antiquity, make an hypothesis of high-level glacial overriding unverifiable. (Auth.)

E-43125

Bleil, U., Thiede, J., **Geological history of Cenozoic polar oceans: Arctic versus Antarctic—an introduction**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.1-8, 21 refs.

DLC QE350.6.N38 1988

The background for the workshop is set with this historical review of the geology during the Cenozoic era. It was by then that both polar regions had turned from a pre-glacial to a glacial mode. Both hemispheres experienced rapid and extreme climatic changes and sedimentation was strongly affected. The aims of the workshop are established, primary areas of study are delineated, and the various factors influencing the studies, such as solar radiation, Earth's rotational orbit, establishment of polar ice covers, and the marine biota of the polar environments, are pointed out.

E-43126

Johnson, G.L., **Morphology and plate tectonics: the modern polar oceans**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.11-28, 44 refs.

DLC QE350.6.N38 1988

The sea bed morphologies of both the Arctic Ocean and the circumpolar antarctic seas are poorly known due to their geographic remoteness, harsh climate, and the cover of sea ice in the Arctic and extensive ice shelves in the Antarctic. This paper summarizes the present state of knowledge. The future use of aero-gravimetric and satellite altimeter sensors will help to remedy this situation. Both oceanic areas are vital to paleo- and present climate as they are the source of the deep waters of the world's oceans. (Auth.)

E-43127

Hinz, K., Hemmerich, M., Salge, U., Eiken, O., **Structures in rift-basin sediments on the conjugate margins of western Tasmania, South Tasman Rise, and Ross Sea, Antarctica**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.119-130, 16 refs.

DLC QE350.6.N38 1988

Complex structures in sediments suggesting extensive wrench faulting have been observed on seismic records from the northern part of the Ross Sea, from the rift basin off West Tasmania and the rift basins of the South Tasman Rise. Wrench faulting affected rift-fill and transgressive strata in these areas up to the Eocene, when deformation came to a halt. The end of wrench deformation is equated with the final separation of the Australian and Antarctic Plates and the establishment of open marine conditions. (Auth.)

E-43128

Miller, H., Henriët, J.P., Kaul, N., Moons, A., **Fine-scale seismic stratigraphy of the eastern margin of the Weddell Sea**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.131-161, 13 refs.

DLC QE350.6.N38 1988

High-resolution reflection seismic investigations were carried out along the eastern margin of the Weddell Sea by R.V. *Polarstern* in the austral summer 1986-1987. The very high resolution achieved on most profiles allows a refinement of previous seismostratigraphic work in this region. Two main survey areas are discussed in this paper: a seismic grid shot off Cape Norvegia in the area of the ODP Sites 692 and 693, framing the Wegener Canyon and exploring the local geological setting of the Explora Escarpment; a high-resolution seismic transect and grid covering the continental shelf, slope and rise north of Halley Bay and yielding a fine-scale picture of the distal part of the

Crary Fan deposits. On ODP Site 693, different depositional sequences of both Mesozoic and Cenozoic age can be identified. The Cenozoic sequences are correlated with the results of the ODP drilling. In the survey area on the continental slope and rise north of Halley Bay, the fan sequences lap on a major erosional unconformity which seems to correlate with the lower Cretaceous-lower Oligocene unconformity on Site 693. The fan sequences display remarkable interactions between depositional, sediment-tectonical and erosional processes. At the foot of the upper continental slope off Halley Bay, a deep buried channel is observed, bordered to the north by a steep and high buried scarp. The channel fill deposits are characterized by the presence of large olistolith-like structures. (Auth.)

E-43129

Henriët, J.P., Miller, H., **Some speculations regarding the nature of the Explora-Andenes Escarpment, Weddell Sea**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.163-169, 6 refs.

DLC QE350.6.N38 1988

In this paper a few hypotheses are discussed regarding the nature and origin of the Explora-Andenes Escarpment, a major morphological and structural feature along the northeastern margin of the Weddell Sea. The original hypothesis implying the presence of an 'outer high' of magmatic origin is questioned in view of recent morphological data, high-resolution reflection seismic profiles, and grab sampling. Alternative hypotheses are advanced, one of them proposing that the outer high is built up of stacked sedimentary rocks scraped off from the oceanic crust in a compressive or transpressive deformation regime. (Auth.)

E-43132

Henrich, R., **Cycles, rhythms, and events in Quaternary arctic and antarctic glaciomarine deposits**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.213-244 (Pertinent p. 213-215, 235-244), Refs. p.240-244.

DLC QE350.6.N38 1988

Highly variable facies patterns of sub-arctic glaciomarine continental margin environments contrast with less pronounced variations in antarctic deposits. Shallow portions of the sub-arctic shelves reveal regressive facies successions comprising basal lodgement till and high energy reworked top sequences during glacio-isostatic uplift. Deeper portions of sub-arctic shelves record advance/retreat cycles of continental ice with up to 150 m thick glacial units which are separated by glacial erosional surfaces. Greatest thicknesses occur on the shelf break and upper slope with depocenters situated at the mouth fans. Prograding slope sequences reveal a complex sigmoid-oblique seismic character formed by alternating build-up during glacial progradation and depositional bypass/erosion in the topset during interglacial periods. Antarctic shelf deposits reveal biogenic siliceous muds or gravelly diamictos with admixtures of a monogenetic biogenic epifauna deposited at low sedimentation rates. Sub-arctic and antarctic deep-sea sediment records reflect glacial/interglacial variations in carbonate and opal productivity and ice-rafted debris input. In Norwegian-Greenland Sea's deep sea pelagic environments widespread distribution of dark diamictos indicates extensive advances of the continental ice-sheets onto the shelves and permits connection of open ocean with shelf records. In the Weddell Sea, glacial, transitional and interglacial facies patterns correspond to advance/retreat cycles of the antarctic ice-sheet, episodic development of floating ice-shelves, variations in the extension of sea

ice coverage and cyclic development of polynyas within the Weddell Sea sea ice-cover. (Auth.)

E-43140

Gosselin, D.C., Laul, J.C., **Chemical characterization of a unique chondrite: Allan Hills 85085**, *Meteoritics*, June 1990 25(2), p.81-87, 36 refs.

Allan Hills 85085 is a new and very important addition to the growing list of unique carbonaceous chondrites because of its unique chemical and mineralogical properties. Previously published data on ALH85085 have established its bulk composition, gross levels of volatile depletion, siderophile enrichment, and the unique character of this meteorite. This chemical study provides more precise data on the major, minor, and trace element characteristics of ALH85085. ALH85085 has compositional, petrological, and isotopic affinities to Al Rais and Renazzo, and to Bencubbin-Weatherford. The similarities to Al Rais and Renazzo, in particular, suggest similar formation locations and thermal processing, possibly in the vicinity of CI chondrites. Petrologic, compositional and isotopic studies indicate that the components that control the abundance of the various refractory and volatile elements were not allowed to equilibrate with the nebula as conditions changed. (Auth. mod.)

E-43141

Rubin, A.E., Kallemeyn, G.W., **Lewis Cliff 85332: a unique carbonaceous chondrite**, *Meteoritics*, Sep. 1990 25(3), p.215-225, 63 refs.

Lewis Cliff 85332 (LEW85332) is a highly unequilibrated unique carbonaceous chondrite. It resembles CI and "CR" chondrites in its abundance ratios of refractory lithophiles and refractory siderophiles, but differs significantly from these groups in important ways: relative to CI chondrites, LEW85332 has low abundances of Mn, Se, Zn and most volatile siderophiles; relative to "CR" chondrites, LEW85332 has high abundance ratios of Mn and most volatile siderophiles. Chondrules are smaller than those in CV and CM chondrites and bigger than those in most CO chondrites. Two melilite-rich fluffy type-A refractory inclusions were observed. Weathering of LEW85332 has resulted in the formation of 6.2 vol.% limonite; 3.9 vol.% metallic Fe-Ni remains. The inferred original metallic Fe-Ni abundance (13-15 wt.%) is very high for a carbonaceous chondrite. (Auth. mod.)

E-43152

Okano, O., Nakamura, N., Nagao, K., **Thermal history of the shock-melted antarctic LL-chondrites from the Yamato-79 collection**, *Geochimica et cosmochimica acta*, Dec. 1990 54(12), p.3509-3523, 75 refs.

The Sr and rare gas isotopic compositions and abundances of lithophile trace elements (K, Rb, Sr, Ba, and REEs) were determined for a series of shock-melted Yamato-79 LL-chondrites to investigate their late thermal history and the chemical features of shock processes. All meteorites show similarities in shock ages as confirmed by Rb-Sr internal isochron and K-Ar dating, rare gas compositions as well as cosmic-ray exposure ages, petrographic textures, and sampling sites in Antarctica. These results indicate that all of these meteorites are part of the same fall. The 1.2 Ga shock event caused a severe melting followed by recrystallization of olivine and clinopyroxene, vesiculation, shock-induced alkali homogenization, and local isotopic equilibration or perturbation of the Rb-Sr system. The degrees of shock effects are variable from specimen to specimen and from portion to portion, even in a single specimen. Model calculations of Fe diffusion in olivine suggest that hot and cold materials were in close contact in the impact ejecta sheets of the parent body. From these model calculations and the evidence provided by cosmogenic rare gas compositions, it is concluded that an impact melt ejecta pile composed of hot and cold brecciated materials had formed at depth in an impact crater by the 1.2 Ga event. The parent body was fragmented to me-

ter-size stones by an additional collision at about 28 Ma, resulting in the formation of the parent material of the Yamato-79 shocked chondrites. (Auth.)

E-43153

Brearley, A.J., **Carbon-rich aggregates in type 3 ordinary chondrites: characterization, origins, and thermal history**, *Geochimica et cosmochimica acta*, Mar. 1990 54(3), p.831-850, Refs. p.848-850.

This paper presents the results of detailed transmission electron microscopic studies of C-rich aggregates, and examines the implications for their origins and the thermal histories of type 3 ordinary chondrites. The results are based on observations from C-rich aggregates in three type 3 ordinary chondrites: Sharps (H3), ALH A77011 (L/LL3), ALH A81024 (H/L3), (ALH A77011 is not paired with ALH A81024), and two type 3 C-rich chondritic clasts in the solar wind-bearing regolith breccias Dimmitt (DT1) and Plainview (PV1). A moderately shocked clast from Sharps, which contains C-rich aggregates, has also been studied. (Auth.)

E-43160

Palais, J.M., Petit, J.R., Lorius, C., Korotkevich, Y.S., **Tephra layers in the Vostok ice core: 160,000 years of southern hemisphere volcanism**, *Antarctic journal of the United States*, 1989 24(5), p.98-100, 14 refs.

Recent studies of a deep ice core from Vostok Station, Antarctica, have focused on the climatic and carbon-dioxide record contained in the core, which covers the last glacial/interglacial climatic cycle (approximately 160,000 years). Other work has examined the aerosol record (continental and marine impurities) preserved in the ice and its relationship to climate. This paper reports on preliminary studies of a number of visible dust layers identified in the core that were found to contain volcanic ash (tephra).

E-43161

Palais, J.M., Kirchner, S., Delmas, R., **Identification and correlation of volcanic eruption horizons in a 1,000 year ice-core record from the South Pole**, *Antarctic journal of the United States*, 1989 24(5), p.101-104, 9 refs.

Recent work on a 130 m ice core from the South Pole produced a 1,000-year glaciochemical record from which were identified a number of horizons that were thought to be due to volcanic eruptions. Several of these layers, identified because of their elevated sulfuric acid concentrations, were recently studied to try to identify glass shards from the volcanic eruptions thought to have produced the acid fallout. Bulk meltwater samples from nine of these horizons were filtered, and the insoluble microparticles on the filters were examined and analyzed by scanning electron microscope and energy-dispersive X-ray analysis. The accuracy and precision of the analyses were determined by repeated measurements of synthetic and natural glass standards of known composition. Analytical results are presented and discussed.

E-43170

Wei, W., **Reevaluation of the Eocene ice-rafting record from subantarctic cores**, *Antarctic journal of the United States*, 1989 24(5), p.108-109, 9 refs.

Calcareous nanofossils are documented for the subantarctic *Eltanin* cores 13-4, 24-8, 24-9, and 24-10, from which Eocene ice-rafted quartz was reported earlier. These cores are confirmed as lower-to-middle Eocene age and are more precisely dated by calcareous nanofossils. The nanoflora in these cores are typical subantarctic assemblages. This study concludes that the ice-rafted quartz in the Eocene sediment is unlikely to be down-core contaminants from the overlying Neogene sediment, and suggests that the grains are most likely the

results of Eocene ice-rafting from West Antarctica, when the Drake Passage was closed and water circulation patterns were different from those of today. (Auth.)

E-43177

Klepeis, K.A., Lawver, L.A., Sandwell, D., Small, C., **Morphology and tectonic structure of the Shackleton Fracture Zone, *Antarctic journal of the United States*, 1989 24(5), p.126-128, 6 refs.**

During Jan. through May 1989, several detailed geophysical surveys were made of the Shackleton Fracture Zone. The Shackleton Fracture Zone is an active, transpressional boundary between the antarctic and Scotia plates that stretches 800 km across the Drake Passage to join the southern end of South America with the tip of the Antarctic Peninsula. From Jan. to early Mar., high-resolution, multibeam sonar data were collected with NOAA's Seabeam-equipped vessel R/V *Surveyor* along the length of the Shackleton Fracture Zone and near its intersection with Elephant I. This cruise was part of NOAA's Antarctic Living Marine Resources program and enabled the collection of Seabeam data on an opportunistic basis with little impact on their primary program. In Apr. and May, an R/V *Polar Duke* cruise to the Bransfield Strait allowed supplementation of the Seabeam bathymetric mapping with several single-channel seismic lines.

E-43178

Reid, D.E., **Quaternary marine geology of the northwestern Ross Sea, *Antarctic journal of the United States*, 1989 24(5), p.128-130, 3 refs.**

On the final scientific expedition of the USCGC *Glacier* during Deep Freeze 87, 29 piston and gravity cores and approximately 700 km of sparker seismic data were collected from the outer continental shelf and slope of the northwestern Ross Sea. The cores were subjected to a detailed sedimentological study resulting in the identification of basal tills, glacial-marine sediments, a wide range of sediment gravity flow units, and carbonate deposits. A primary objective of the study was to resolve the stratigraphy and lithofacies relationships generated by the advance and retreat of the late Wisconsin ice sheet. This is important because the identification of basal tills succeeded seaward by glacial-marine deposits would establish the northernmost limit of grounded ice in this region during the last glacial maximum. A second objective was to characterize carbonate deposition in a polar glacial-marine setting.

E-43180

Bartek, L.R., Anderson, J.B., **Origin and facies distribution of the Recent sedimentary deposits within McMurdo Sound, *Antarctic journal of the United States*, 1989 24(5), p.132-134, 12 refs.**

A detailed study of cores and high-resolution seismic data collected in McMurdo Sound was conducted to improve the understanding of the facies architecture resulting from sedimentation within a high-latitude marginal basin under polar interglacial conditions. The significant aspect of this study is that McMurdo Sound shares characteristics with both rift basins and back-arc basins. Thus, the results from this work are applicable to a wide range of ancient analogs and may provide additional insight into the paleoenvironments of ancient stratigraphic successions.

E-43208

Woolfe, K.J., **Trace fossils as paleoenvironmental indicators in the Taylor Group (Devonian) of Antarctica, *Palaeography, palaeoclimatology, palaeoecology*, Nov. 1990 80(3/4), p.301-310, 55 refs.**

The Taylor Group of southern Victoria Land contains varied and abundant trace fossils, which have been interpreted by palaeontolo-

gists as indicating marine deposition. However, sedimentologists have largely favored non-marine deposition on the basis of desiccation polygons, fining upward cycles, unidirectional paleocurrents, small channels, red beds and paleosols. The debate is reconciled by a reinterpretation of the trace fossil assemblage. It is shown that widespread and well preserved *Cruziana*, *Diplichnites*, *Rusophycus* and *Skolithos* which have previously been used as marine indicators comprise an ichnofacies (*Scoyenia*) which is entirely typical of fresh water. (Auth.)

E-43251

Veevers, J.J., **Antarctica-Australia fit resolved by satellite mapping of oceanic fracture zones, *Australian journal of earth sciences*, June 1990 37(2), p.123-126, 20 refs.**

Sea floor spreading between Antarctica and Australia was resolved into two stages: fast (27 mm/year), from the present to 49 Ma on a northerly azimuth constrained by well mapped fracture zones; and slow (4.5 mm/year), from 49 Ma to break-up at 96 Ma. A north-westerly azimuth was inferred by interpolation between the position of the continents at 49 Ma and the initial fit of the continents at break-up at 96 Ma; during this stage, jumps to Australia of the spreading ridge west of the Spencer-George V Fracture Zone were postulated to have transferred parts of the Australian Plate to Antarctica. Recently acquired satellite gravity trends confirm the inferred northwesterly azimuth and ridge jumps of the early spreading stage. (Auth.)

E-43252

Hall, K.J., **Quaternary glaciations in the southern ocean: sector 0 long.-180 long., *Quaternary science reviews*, 1990 9(2/3), p.217-228, Refs. p.227-228.**

The location of the islands close to the Antarctic Convergence is potentially important for studying fluctuations in its position; northward migration cools the islands and causes glacier expansion. Intercalation of glacial sediments and lava flows on Marion, Kerguelen and Heard Islands provides some evidence of glacier fluctuations during the Mid-Late Quaternary, but much of the data are equivocal. The most detailed dated Quaternary record is from Marion I. where the oldest glaciation (stage 8) had five stadials, the penultimate glaciation (stage 6) had three stadials, and the last glaciation had ended by 12 ka BP. Glacier expansion is closely related to northward migration of the Antarctic Convergence, when lower temperature converts the high rainfall into snowfall. (Auth. mod.)

E-43253

Clapperton, C.M., **Quaternary glaciations in the southern ocean and Antarctic Peninsula area, *Quaternary science reviews*, 1990 9(2/3), p.229-252, Refs. p.251-252.**

There are three main difficulties in constructing detailed time series for Late Quaternary glacier fluctuations in the southern ocean-subantarctic region: sea level control on ice extent, differential tectonics, and lack of material for radiometric dating. South of 60S, the glacial Equilibrium Line Altitude is low enough for glaciers to expand without a decrease in temperature, if sea level falls. Tectonic uplift during the Quaternary may explain why the Falkland Is. did not develop most of their glacial and nivoglacial features until the last glaciation. The South Shetland Is. have a unique assemblage of raised marine features in the subantarctic. Some radiometric dates obtained, together with relative weathering criteria and drift distribution, suggest that glaciers in the southern ocean and subantarctic region have fluctuated synchronously with glaciers elsewhere in the Southern Hemisphere during the last 100 ka. The last glaciation maximum culminated after 26 ka BP, and glacier advances are inferred for the late-glacial intervals (15-14 ka and 12-10 ka BP) and the Neoglacial interval (last 5 ka). (Auth. mod.)

E-43269

Weber, W., **Antarctic tectonic subdivision and historical minerogenetic analysis** [Metallogenetisch-minerogenetische Rayonierung Antarktikas. I. Tektonische Rayonierung und historische minerogenetische Analyse], *Zeitschrift für angewandte Geologie*, Sep. 1988 34(9), p.257-264, In German with English and Russian summaries. 53 refs.

DLC QE1.Z39

The Antarctic Earth's crust consists of the Precambrian East Antarctica craton and a mobile West Antarctica block field. This block field can be divided into a Proterozoic-early Paleozoic region at the proto-Pacific margin of the East Antarctica craton and a Paleozoic/Meso-/Cenozoic active Pacific mobile belt. The minerogenic evolution of the continent is to divide into an Archaean, a Proterozoic and a late Rhiphaean-Phanerozoic main epoch. These minerogenic main epochs are divided into epochs and subepochs. (Auth.)

E-43270

Weber, W., **Metallogenetic-minerogenetic subdivision of Antarctica. II. Minerogenetic units** [Metallogenetisch-minerogenetische Rayonierung Antarktikas. II. Minerogenetische Einheiten], *Zeitschrift für angewandte Geologie*, Oct. 1988 34(10), p.295-302, In German with English and Russian summaries. 75 refs.

DLC QE1.Z39

At the base of a small-scale temporal and regional minerogenic analysis of the antarctic crust there are minerogenic units (superprovinces, provinces, subprovinces). These units are reconstructed for the Archaean minerogenic main epoch, for the early Proterozoic and the middle/late Proterozoic epochs, and for the minerogenic epochs of the late Rhiphaean/Phanerozoic development. (Auth.)

E-43284

Kagi, H., Takahashi, K., Masuda, A., **Strange Raman band of diamond particulates contained in antarctic meteorite, Yamato-791538 (ureilite)**, *Nihon gakushiin. Proceedings of the Japan Academy. Series B*, June 1990 66(6), p.101-104, 4 refs.

Raman spectra of micro-diamonds contained in antarctic ureilite, Y-791538 were observed by laser Raman microprobe. Based on the resultant spectra, diamond particulates could be divided mainly into two groups. For the first group, observed spectra have ordinary Raman shift at 1332/cm with fluorescence band. Spectra classified into the second group have anomalous Raman shift at 1323/cm, free from the fluorescence band. Three possible interpretations are proposed for the significant difference in the Raman shift. (Auth.)

E-43285

Kaminuma, K., ed, NIPR Symposium on Antarctic Geosciences, 10th, Tokyo, Oct. 31-Nov. 1, 1989, **Proceedings of the NIPR Symposium on Antarctic Geosciences, No.4**, Tokyo, National Institute of Polar Research, 1990, 251p., Refs. passim. For individual papers see E-43286 through E-43291, E-43296, E-43297, E-43299 through E-43301, E-43304, F-43302, J-43294, L-43292, L-43293, L-43295, L-43298, and L-43303.

This volume contains the proceedings of the 10th Symposium on Antarctic Geosciences held in Tokyo Oct. 31-Nov. 1, 1989, and it comprises 19 full length papers pertinent to Antarctica as well as 8 abstracts of papers. The papers are arranged in 3 groups according to their field of survey: Earth Sciences in the Sör Rondane Mountains, Earth Sciences in Enderby Land and Showa Station, Earth Sciences in other regions of the Antarctic, and the topics on Gondwanaland. The program of the Symposium and an author index are also presented.

E-43286

Takahashi, Y., Arakawa, Y., Sakiyama, T., Osanai, Y., Makimoto, H., **Rb-Sr and K-Ar whole rock ages of the plutonic bodies from the Sör Rondane Mountains, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.1-8, 11 refs.

Rb-Sr whole rock isochron ages were determined on the 2 plutonic bodies from the Sör Rondane Mountains. Tonalite of the Nils Larsen Group (Nils Larsen Tonalite), being one of the representative older type intrusive rocks, gave an age of 956 Ma with an initial Sr-87/Sr-86 ratio of 0.7024. The other is the Lunckeryggen Granite, which is the most representative granite of younger type, and gave an age of 525 Ma with an initial Sr-87/Sr-86 ratio of 0.7050. Two whole rock K-Ar ages on this granite were 406 and 415 Ma. It appears from the above that tonalitic magma has been intruded in Late Precambrian and granitic magma in Early Paleozoic. Another thermal event occurred in Middle Paleozoic. Difference of initial Sr isotopic ratios between the Nils Larsen Tonalite and the Lunckeryggen Granite may reflect the crustal development in this area. (Auth.)

E-43287

Makimoto, H., Asami, M., Grew, E.S., **Metamorphic conditions of ultramafic lenses from the eastern Sör Rondane Mountains, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.9-21, Refs. p.20-21.

Lenses up to 5 m in size of ultramafic rocks occur in quartzofeldspathic, locally migmatized gneisses at 4 localities of the eastern Sör Rondane Mountains. A composite lens at one locality consists of harzburgite, orthopyroxenite and garnet amphibolite; a second consists entirely of harzburgite. Temperature estimates for the ultramafic lenses represent that they preserved at least two stages of metamorphic temperature conditions. The higher temperatures (about 750 C), estimated by the maximum Al-content of orthopyroxene and the pyroxene geothermometers, are consistent with those of the early granulite-facies metamorphic event reported in the eastern Sör Rondane Mountains. This indicates that the ultramafic lenses and the surrounding metamorphic rocks recrystallized under the same granulite-facies metamorphic temperature conditions. The lower temperatures (520-670 C) obtained from garnet rim-biotite pairs probably correspond to the later, discrete amphibolite-facies event in the Mountains. (Auth.)

E-43288

Asami, M., Grew, E.S., Makimoto, H., **Staurolite-bearing corundum-garnet gneiss from the eastern Sör Rondane Mountains, Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.22-40, Refs. p.38-40.

Staurolite is found as inclusions in garnet in a corundum-garnet gneiss from an outcrop of two-pyroxene gneiss in the eastern Sör Rondane Mountains. The staurolite is a zinc-poor variety of normal iron content and occurs only in 'domains', consisting mainly of plagioclase, enclosed in the zoned garnet with magnesian cores. From textural and mineralogical observations, it is possible to distinguish a staurolite-bearing mineral association in the domains and a granulite-facies association of the garnet core with the matrix constituents plagioclase, biotite, sillimanite, corundum, spinel, magnetite and ilmenite. On the basis of textural features and paragenetic relations, staurolite in this gneiss is interpreted to be a relic that was isolated from the matrix by growing of garnet in a prograde metamorphic process attaining the granulite facies. A later, probably amphibolite-facies metamorphic episode is suggested by Fe-Mg redistribution between garnet and biotite in direct contact. (Auth. mod.)

E-43289

Hirakawa, K., Moriwaki, K., **Former ice sheet based on the newly observed glacial landforms and erratics in the central Sör Rondane Mountains, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.41-54, 6 refs.

Reconstruction of the former ice sheet extent was revised on the basis of newly observed glacial landforms and erratics in the central Sör Rondane Mountains. Roches moutonnées on the summit of southern Lunckeryggen and erratics on the flat summit surface of west Brattnipene are in particular significant in revising the reconstruction of the former ice sheet and its longitudinal profile. Central Sör Rondane Mountains were mostly overridden by the ice sheet. Roches moutonnées and ice-smoothed mountain slopes in the summit area of southern Lunckeryggen, 1000 m or more above the present outlet glacier surface, are evidence of the northward advance of ice fall, about 10 km, where the ice was at least 400 m thicker than at present. (Auth. mod.)

E-43290

Matsuoka, N., Moriwaki, K., Iwata, S., Hirakawa, K., **Ground temperature regimes and their relation to periglacial processes in the Sör Rondane Mountains, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.55-66, 11 refs.

Rock and soil temperatures were observed on some nunataks in the Sör Rondane Mountains during 1985-1989. Three different types of automatic recorders made it possible to collect the temperature data at 1- to 4 h intervals throughout the year. Multiple freeze-thaw events were recorded on many bedrock surfaces and in soil surface layers during the summer season. The number of freeze-thaw cycles is comparable to those in mid-latitude alpine environments where the frost action, including frost weathering, heave and creep, is regarded as the prevailing geomorphic process. Geomorphic change by the frost action, however, is believed to be insignificant in most of the Sör Rondane Mountains, because the water content of the ground is generally too low. The frost action may be effective only on the ground with a fairly high moisture content due to snow spray as well as with frequent freeze-thaw cycles. (Auth.)

E-43291

Funaki, M., Tokieda, K., **Natural remanent magnetizations of granite and syenite from Pingvinane and Lunckeryggen in the Sör Rondane Mountains, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.67-79, 12 refs.

The characteristics of the natural remanent magnetizations (NRMs) of granite and syenite from Pingvinane and Lunckeryggen in the western Sör Rondane Mountains were elucidated. In order to endorse the NRMs, AF and thermal demagnetization, thermomagnetic and magnetic hysteresis properties were analyzed. Furthermore, microscopic observations were carried out for identification of the magnetic grains. Reliable mean NRM directions acquired in early Silurian period were given from the Pingvinane granite and the Lunckeryggen syenite. The syenite and granite from Lunckeryggen include magnetite for NRM carriers with heterogeneous size distributions, which would cause a wide scattering of their NRMs. The virtual geomagnetic pole positions calculated from the established NRMs were at 37.4S, 10.5W, for the Pingvinane granite and 44.6S, 1.0E, for the Lunckeryggen syenite. These positions are consistent with the previous result reported by J.D.A. Zijdeveld. (Auth. mod.)

E-43296

Hayashi, M., **Glacial history with special reference to the past lacustrine deposits in the Mt. Riiser-Larsen area, Enderby Land, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.119-134, 12 refs.

The Mt. Riiser-Larsen area consists of ice-free mountains of the isolated massifs of the Tula Mountains, Enderby Land. Landforms and glacial history have been studied in this area with special reference to the past lacustrine deposits, "Richardson Clay". The glacial deposits were divided into 3 groups: the Tula Moraine, and Mt. Riiser-Larsen Moraines I and II. The glacial history of this group is summarized, and correlates with that of the Vestfold Hills and the Prince Olav Coast, East Antarctica. A raised beach about 3 m in altitude, and a fluvioglacial channel in this area, are believed to have been formed during the Holocene. (Auth. mod.)

E-43297

Arima, M., Motoyoshi, Y., Shiraishi, K., **Stability of osumilite in granulite facies metamorphism: KMAS system and natural occurrences**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.135-141, Refs. p.139-141.

The stability relation of osumilite in granulite facies rocks is evaluated in the light of the recent study of osumilite-bearing granulites in the Paradise River area, Canada. The mineral parageneses in the Paradise River granulites indicate that osumilite is stable at temperatures lower than those required for sapphirine-quartz stability. The P-T grid deduced from the Paradise River occurrence is in accordance with that proposed by E.S. Grew for osumilite-sapphirine-quartz granulites in the Napier Mountains, Enderby Land. This conclusion is supported by high pressure experimental results in the KMAS system, which suggest that osumilite is stable at temperatures lower than the univariant reaction $En + Sil = Sa + Q$. (Auth. mod.)

E-43299

Wada, H., Okada, H., **Isotopic studies of carbonates from CIROS-1 drillhole, western McMurdo Sound, Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.149-164, 30 refs.

Carbonates from core samples from the CIROS-1 drillhole in western McMurdo Sound were analyzed for isotopic, chemical and mineralogical compositions. Carbonates occur as both cement (Mg-calcite and aragonite) and vein filling (aragonite). Samples are generally depleted in O-18 to a level that is consistent with pore-water chemistry and downhole temperatures as high as 67 C. However, the samples from the upper part of the hole (<300 m sub-bottom depth) contain extremely O-18-depleted aragonite, suggesting precipitation from glacier- or ice-sheet-source meteoric water. Semi-micro scale isotopic analyses along two transects of aragonite veins revealed that $\delta^{13}C$ values vary from 3 to 5 per mill within a vein. Near the bottom of the drillhole, $\delta^{18}O$ values in pore water remained constant during the aragonite precipitation. At shallow depths about 260 m below the sea floor, $\delta^{18}O$ values in pore water were variable, probably owing to the different contribution of glacier or ice-melt water during the precipitation. (Auth. mod.)

E-43300

Matsumoto, G.I., Watanuki, K., Torii, T., **Geochemical features of hydroxy acids in soil samples from the McMurdo Dry Valleys, Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.165-171, 17 refs.

Hydroxy acids in 12 soil samples from the McMurdo Dry Valleys have been studied to clarify their features and to elucidate the source materials. A suite of 3-hydroxy (C8-C30) and (*omega*-1)-hydroxy (C22-C30) acids presenting the predominance of even-carbon numbers were found in the soil samples, while 2-hydroxy (C8-C30) and *omega*-hydroxy (C8-C30) acids showed no even-carbon predominance. These hydroxy acids are attributed to the degradation products of wind-transported cyanobacterial mats in and around streams, lakes and ponds, as well as to the past biological activity, involving bacteria, cyanobacteria and fungi, rather than originating from the Beacon Supergroup of Gondwanaland sediments and living organisms. (Auth.)

E-43301

Niida, K., **Glass in mantle-derived peridotite xenoliths from the McMurdo Volcanic Group, Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.172-180, 28 refs.

Glass-bearing, mantle-derived peridotite xenoliths have been found in Late Cenozoic basanites at Turtle Rock and McMurdo Station. Glass in these xenoliths occurs as veinlets, interstitial pools, and thin films surrounding the primary xenolith minerals. The glass analyzed has three different compositions. Low-silica high-alkali glasses (42-48 wt% SiO₂, 4-6 wt% Na₂O + K₂O) are likely to represent volatile-rich melts which were incorporated from the host basanite magma. High-silica low alkali glasses (53.5-56 wt% SiO₂, 4-5 wt% Na₂O + K₂O) are non-alkaline and were possibly generated by decompressional breakdown of pargasitic amphibole. High-silica high-alkali glasses (55.5-57 wt% SiO₂, 14-15 wt% Na₂O + K₂O) are unique and resemble the chemical composition of the most evolved nepheline-trachyte. (Auth.)

E-43304

Sakai, H., **Paleomagnetic study of ODP Leg 119—Kerguelen Plateau and Prydz Bay**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.201-212, 14 refs.

ODP Leg 119 drilled at the Kerguelen Plateau and in Prydz Bay. Hole 745B, on the southern Kerguelen Plateau, gave the excellent reversal sequence during the last 6 Ma including the Cobb Mt. event in the Matuyama chron and the unidentified subchron in the Gilbert chron. A limestone sequence at Hole 738C from Turonian to Santonian stage shows the low paleolatitude (54S) compared with the present (64S). This paleolatitude is nearly the same as the Tertiary paleolatitude estimated from VGP of Antarctica. The basaltic rocks below the limestone sequence showed two groups of magnetic inclinations around +50 and -70 deg. In Hole 742C of Prydz Bay, a glacial sequence down to 316 mbsf (meters below sea floor) was drilled. Magnetic susceptibility of this sequence showed a good correlation with the change of lithology. Magnetic inclinations of the sequence from middle Eocene to Oligocene showed the dominant normal polarity zone with several short reversals. It suggests that a large glacier complex existed in Prydz Bay during earliest Oligocene and possibly during late middle Eocene period. (Auth. mod.)

E-43314

Fitzsimons, S.J., **Ice-marginal depositional processes in a polar maritime environment, Vestfold Hills, Antarctica**, *Journal of glaciology*, 1990 36(124), p.279-286, 37 refs.

This study investigates the processes of ice-marginal sedimentation in Vestfold Hills. Most debris is released from the ice when basal and englacial debris bands become warped and reach the surface of the glacier, and where the debris bands are exposed by ablation of the ice surface. Once released, the debris is redistributed in the ice-marginal area by depositional processes that are controlled by the availability of water. During the short summer, melt water from snow and ice saturates the newly released debris and causes sediment flows and other mass-movement deposits. Melt-out and sublimation tills form after the layer of debris on the moraines is consolidated and melting rates decrease. When the thickness of deposits on the surface of ice-cored moraines reaches or exceeds the depth of summer thawing, the ice core no longer melts and the moraines become semi-permanent features. The sediments and land forms of the ice-marginal area closely resemble those formed by sub-polar glaciers with a complex thermal regime, and are unlike those that form at the margins of dry-based polar glaciers. Although glacier thermal regime is understood to be a major control on debris dispersal and processes of glacial sedimentation, the evidence from Vestfold Hills suggests that the primary control is the climate of the glacier terminus area. (Auth.)

E-43332

Cassidy, D.S., **Antarctic Marine Geology Research Facility and Core Library, 1987-1988 and 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.275-277, 9 refs.

This is the sixteenth in a series of reports that have appeared in the *Antarctic journal of the U.S.* since 1973, providing yearly summaries of project activities at the Florida State University. Details of the collection and distribution of core samples are given, identifying the research vessels and projects involved, including *Eltanin*, *Islas Orcadas*, *Glacier*, *Polar Duke*, IWSOE, DVDP, RISP, and RUBBS. The collecting areas covered most of West Antarctica and samples were distributed to an international clientele in 8 countries, requesting 2255 samples.

E-43358

Andronikov, A.V., **Spinel-garnet lherzolite nodules from alkaline-ultrabasic rocks of Jetty Peninsula (East Antarctica)**, *Antarctic science*, Dec. 1990 2(4), p.321-330, 14 refs.

Lherzolite nodules from an intrusive body of alkaline-ultrabasic rocks on Jetty Peninsula are massive with a porphyritic hypidiomorphic granular texture. The main rock-forming minerals are olivine, pyroxene, garnet and chrome spinel. The nodules are coarse granular spinel-garnet lherzolites. The Al₂O₃ content in enstatites and Ca/(Ca + Mg) ratio in co-existing chrome diopside suggest that equilibrium conditions of the mantle mineral assemblage are: T = 875-990 °C, P = 20-24 kbar, conditions typical of the spinel-pyroxene facies of the upper mantle. Depths of withdrawal of the inclusions do not exceed 60-75 km. Available age determinations of the intrusive alkaline-ultrabasic rocks (145-150 Ma) suggest that alkaline-ultrabasic magmatism and withdrawal of plutonic nodules were related to rifting which resulted in the breakup of the Gondwana supercontinent in the late Mesozoic. (Auth. mod.)

E-43359

Larsson, K., Lindström, S., Guy-Ohlson, D., **Early Permian palynoflora from Milorgfjella, Dronning Maud Land, Antarctica**, *Antarctic science*, Dec. 1990 2(4), p.331-344, Refs. p.343-344.

A preliminary palynological study of Beacon Supergroup sedimentary rocks exposed at Milorgfjella, Queen Maud Land, has yield-

ed a relatively rich and well preserved palynoflora dominated by spores and pollen grains, but also including acritarchs and green algae. The palynoflora is dominated by the pterophyte spores *Punctatisporites gretensis*, *Punctatisporites parvus*, *Granulatisporites* spp., *Microbaculispota tentula*, *Horriditriletes* spp. and *Verrucosisporites andersonii*, and the gymnosperm pollen grains *Plicatipollenites* spp. and *Cannanoropollis* spp. Also present are the lycopod spore *Jayantisporites pseudozonatus*, the praecolpate pollen grain *Marsupipollenites striatus* and the monocolpate pollen grain *Cycadopites cymbatus*. The palynoflora indicates freshwater conditions, or at least a major freshwater influence, on the depositional environment. Comparison of the palynoflora with others from Gondwana suggests an Early Permian (Asselian-Sakmarian) age. (Auth.)

E-43360

Martí, J., Baraldo, A., **Pre-caldera pyroclastic deposits of Deception Island (South Shetland Islands), *Antarctic science***, Dec. 1990 2(4), p.345-352, 15 refs.

The youngest pre-caldera volcanism of Deception I. is represented by a thick sequence of subaerial pyroclastic deposits which has been grouped as the Yellow Tuff Formation. Most of these deposits were related to the explosive activity of a central vent which was destroyed during the formation of the caldera. Two members can be distinguished in this formation. The lower member is mainly composed of 1 to 12 m thick massive pyroclastic flow deposits with interbedded air-fall and surge deposits. The upper member is in stratigraphical continuity with the lower member, and consists of base surge deposits with minor air-fall and thin pyroclastic flow deposits. The pre-caldera deposits have undergone a palagonitic alteration which produced crystallization of smectites, Fe-oxides, zeolites and calcite.

E-43361

Smellie, J.L., McIntosh, W.C., Gamble, J.A., Panter, K.T., **Preliminary stratigraphy of volcanoes in the Executive Committee Range, central Marie Byrd Land, *Antarctic science***, Dec. 1990 2(4), p.353-354, 5 refs.

The West Antarctic Volcano Exploration (WAVE) project is a cooperative investigation involving geologists from United Kingdom, New Zealand and the United States, which seeks to understand the glacial history, physical volcanology, petrology and crustal and mantle evolution of Marie Byrd Land in late Cenozoic times. Field studies, commenced during the 1989-90 season and focussed on the southern Executive Committee Range, include the stratigraphy of the volcanoes, which is reviewed in this short note.

E-43370

Fitzgerald, P.G., Gleadow, A.J.W., **New approaches in fission track geochronology as a tectonic tool: examples from the Transantarctic Mountains, *Nuclear tracks and radiation measurements***, 1990 17(3), International Fission Track Dating Workshop, 6th. Proceedings, p.351-357, 33 refs.

Apatite fission track analysis has been applied to study the uplift history and tectonics of the Transantarctic Mountains (TAM). An uplifted fossil apatite annealing zone has been identified in the apatite age vs. elevation profile and is confirmed by track length data. A "break in slope" in the apatite age profile marks the base of the uplifted partial annealing zone and approximates the time of initiation of uplift of the mountains. Samples below the "break in slope" give information on the rate(s) of uplift. Samples above the break have apatite ages that vary significantly with elevation, but the gradient is not equal to an apparent uplift rate. Rather, it is due to inherited characteristics from the pre-existing partial annealing zone. These samples above the "break in slope" can be used as indicators of paleo-depth in the pre-uplift crust to determine the structure of an area and the displacement across faults. Mountain ranges adjacent to exten-

sional tectonic regimes most likely represent the classical area for finding uplifted partial annealing zones, because stable thermo-tectonic conditions needed to establish the distinctive shape of an apatite annealing zone prior to uplift are often present, and the amount of uplift is such that the annealing zone is likely to be preserved in the rock column. (Auth.)

E-43371

Stump, E., Fitzgerald, P.G., Gleadow, A.J.W., **Comparison through fission-track analysis of portions of Australia and Antarctica adjacent prior to continental drift, *Nuclear tracks and radiation measurements***, 1990 17(3), International Fission Track Dating Workshop, 6th. Proceedings, p.359-365, 37 refs.

Australia and Antarctica have been reconstructed by matching three terranes in western Victoria with three terranes in northern Victoria Land. Apparent fission-track ages from granitic rocks of these matched regions are compared. In western Victoria, Australia, data reflect a history of slow cooling following intrusion in early to middle Paleozoic time. In northern Victoria Land a complex history of cooling and uplift is indicated, with uplift of the present-day mountains commencing approximately 50 Ma. Fission tracks in apatites from most samples from northern Victoria Land were completely reset to zero by the thermal effects of Jurassic tholeiitic magmatism. Apatite in three samples from the western margin of the Wilson Terrane, however, predate the Jurassic and were only partially re-set by this event. Apparent sphene fission-track ages indicate that the three terranes in northern Victoria Land have shared a common thermal history since the Devonian. With the exception of one small area adjacent to the Cretaceous-Tertiary Otway Basin in western Victoria, neither western Victoria nor northern Victoria Land data show a clear influence of rifting and breakup in the late Cretaceous. It is suggested that during extension northern Victoria Land was flanked by two upper plate margins, whereas southeastern Australia was flanked by an upper plate and a lower plate margin, thus accounting for the present-day geomorphic differences between the two regions. (Auth.)

E-43383

Risebrough, R.W., De Lappe, B.W., Younghans Haug, C., **PCB and PCT contamination in Winter Quarters Bay, Antarctica, *Marine pollution bulletin***, Nov. 1990 21(11), p.523-529, 22 refs.

Winter Quarters Bay at McMurdo Station provides docking facilities to visiting ships and is adjacent to a former dump site. Sediments are heavily contaminated with a tarry material and contain a moderately high level of chlorinated biphenyls, in the range of 100-1400 ng/g dry wt. Composition in most samples is identical to that of Aroclor 1260, with no evidence of partial degradation, indicating a dominant point source of contamination. Chlorinated terphenyls, also with a 60% chlorine composition, are present at levels in the order of 30-1200 ng/g. Outside Winter Quarters Bay, PCB levels decrease sharply, by two orders of magnitude over 1 km, and four orders of magnitude at stations 9 and 15 km distant. A substantial modification of the congener composition is evident at the distant stations, but the McMurdo PCB 'signature' nevertheless dominates over the 'global' signature characteristic of PCBs in the global atmospheric circulation. (Auth.)

E-43407

Tapfer, M., **Expedition to the antarctic ice desert, *Universitas***, 1990 32(2), p.121-126.

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In this essay, a brief review is given of recent German experience in Antarctica, and the Second German Neuschwabenland Expedition, in which the author was involved, is described in overview. The objective of the Expedition was to examine the theme of the position and

development of the transantarctic mountain range within Gondwanaland. The examination was done through geochemical and tectonic studies of the Heimefront Range, about 450 km south of Neumeyer Station. This range is referred to as the Kottas Range (Mountains, Orogeny) throughout the essay. The structural geology of the mountains is described and their age is roughly placed in the pre-Cambrian. The field party departed Neumeyer Station on Dec. 20, 1985, returning on Feb. 21, 1986. Since coming back to Germany, the geoscientists involved in the expedition have been engaged in the interpretation of the material gathered and the measurements recorded.

E-43408

Bentley, C.R., ed, **Contributions to antarctic research 1, American Geophysical Union. Antarctic research series**, 1990 Vol.50, 101p., Refs. passim. For individual papers see E-43411 through E-43413, I-43409, I-43410, J-43414 and L-43415.

This first issue of "Contributions to Antarctic Research" of the Antarctic Research Series is designed to complement antarctic fieldwork. It consists of seven papers dealing with aerosol measurements, coastal cloud structure, glacial sediments in the Beardmore Glacier area, Quaternary history of the Ross Sea, minerals in the Lewis Cliff ice tongue, suspended sediments in fjords, and continental margins of the western Weddell Sea, respectively.

E-43411

Hagen, E.H., Koeberl, C., Faure, G., **Extraterrestrial spherules in glacial sediment, Beardmore Glacier area, Transantarctic Mountains, American Geophysical Union. Antarctic research series**, 1990 Vol.50, Contributions to antarctic research 1, edited by C.R. Bentley, p.19-24, 32 refs.

Several hundred spherules have been recovered from the 125- to 500-micron size fractions of sediment deposited by the East Antarctic ice sheet in the Transantarctic Mountains near the Beardmore Glacier. They are glassy in appearance with smooth, unetched surfaces, but many contain crystals of olivine and magnetite. Their abundances in the 125- to 500-micron size fractions of bulk sediment vary from less than one to more than 4000 spherules/100 g of sediment. The abundance of spherules decreases with increasing grain size as observed previously in spherules recovered from antarctic ice and from meltwater pools on the Greenland ice sheet. The major and trace element concentrations of the newly discovered spherules from Antarctica support their extraterrestrial origin. (Auth.)

E-43412

Kellogg, T.B., Kellogg, D.E., Stuiver, M., **Late Quaternary history of the southwestern Ross Sea: evidence from debris bands on the McMurdo Ice Shelf, Antarctica, American Geophysical Union. Antarctic research series**, 1990 Vol.50, Contributions to antarctic research 1, edited by C.R. Bentley, p.25-56, Refs. p.55-56.

The McMurdo Ice Shelf (MIS) preserves a detailed record of glaciologic, sedimentologic, and biotic processes during late Wisconsin and Holocene time. MIS ice deltaO-18 measurements show that the western part of the MIS is maintained by basal freezing. Uncorrected C-14 dates of shells in MIS surface debris have a bimodal distribution with all ages either more than 20,000 years B.P. or less than 7750 years B.P. Combined deltaO-18 and C-14 data demonstrate that two types of debris bands occur on the MIS: bands like those trending north from Black I. are formed by the Debenham (1919) Mechanism, of combined basal adfreezing and surface ablation, and have Holocene C-14 dates; older, remnant bands occur east of Brown Peninsula; in one place they cross the tide crack onto land. Other localities have C-14 ages more than 20,000 years B.P. and deltaO-18 values indicating ice formed from precipitation at eleva-

tions greater than 3000 m that was advected to southern McMurdo Sound. Erratic material from the Transantarctic Mountains is widespread on the MIS. These data combine to suggest that former grounded ice from East Antarctica occupied southern McMurdo Sound. (Auth. mod.)

E-43413

Fitzpatrick, J.J., Muhs, D.R., Jull, A.J.T., **Saline minerals in the Lewis Cliff ice tongue, Buckley Island Quadrangle, Antarctica, American Geophysical Union. Antarctic research series**, 1990 Vol.50, Contributions to antarctic research 1, edited by C.R. Bentley, p.57-69, Refs. p.68-69.

Saline minerals have been found in a moraine and as englacial deposits in the vicinity of Lewis Cliff, Buckley I. Quadrangle. These are the first reported occurrences of these minerals from the interior of the continent and the first reported occurrence of borax anywhere on the continent. The nahcolites are believed to have precipitated from a subglacial solution formed by the mixing of a sodium-rich, CO₂-charged thermal spring water with isotopically light glacial meltwater. The origin of the borax/nahcolite assemblage in the moraine is as yet unknown. (Auth. mod.)

E-43426

Eugster, O., Niedermann, S., **Solar noble gases in the unique chondritic breccia Allan Hills 85085, Earth and planetary science letters**, Dec. 1990 10(2/4), p.139-147, 33 refs.

The chemical composition of the chondritic breccia Allan Hills 85085 does not match that of any known group of chondrites. In addition, this meteorite contains extremely fine-grained fragments and small chondrule-like inclusions. The authors investigated the noble gas isotopic abundances in bulk samples, in a fine-grained silicate fraction, and in a coarse-grained fraction containing the metal phase. Solar gases are present in the fine-grained silicates and indicate processing of the ALH85085 material in an asteroidal regolith. He and Ne are enriched in a <40 micron grain size fraction indicating surface implantation of solar particles. The solar noble gas component is characterized by an elemental abundance pattern and isotopic ratios typical for lunar and asteroidal regolith material: He-4/Ar-36=469, Ne-20/Ar-36=4.2, He-4/He-3=2300, Ne-20/Ne-22=12.5. The major noble gas components in the bulk and coarse-grained fractions are planetary type trapped gases. Abundances and isotopic composition are similar to those in type-2 and -3 chondrites. In some respects ALH85085 resembles another unique chondrite, Kakangari, but it differs in an FeNi content that is almost twice as high as in Kakangari, and in other characteristics. Both the cosmic-ray exposure age and the K-Ar-40 gas retention age are relatively low. The travel time of ALH85085 as a small object in space was 1.7 Ma and a fraction of Ar-40 was lost as indicated by the K-Ar-40 gas retention age of 2900. (Auth.)

E-43427

Wasson, J.T., Kallemeyn, G.W., **Allan Hills 85085: a subchondritic meteorite of mixed nebular and regolithic heritage, Earth and planetary science letters**, Dec. 1990 101(2/4), p.148-161, 29 refs.

Allan Hills 85085 is a tiny (12-g) meteorite whose closest relatives are the Renazzo and Al Rais chondrites and the subchondritic host material in the Bencubbin meteorite. Its bulk composition is generally chondritic, but siderophile abundances are tens of per cent higher and abundances of moderately volatile elements factors of 2-4 times lower than in known authentic chondrites. In addition to this unusual composition ALH85085 has an extremely small particle size, metal that shows no evidence of metamorphic equilibration, and a very high abundance of pyroxenitic lithic particles. Chondrules are rare and small; most are pyroxenitic and chemically similar to the lithic parti-

cles. Previous workers have inferred that most or all of these strange features of ALH85085 resulted from nebular processes, but the authors suggest that melting, vaporization, outgassing, condensation and size-sorting in a cloud of impact ejecta offer a more viable alternative. Until additional similar materials have been discovered and characterized, it seems safest to infer nebular properties and processes on the basis of the record in chondrites regarding which there is little doubt that nebular processes were dominant. (Auth.)

E-43429

Vennum, W.R., Nejedly, J.W., **Clay mineralogy of soils developed on weathered igneous rocks, West Antarctica, New Zealand journal of geology and geophysics**, 1990 Vol.33, p.579-584, Refs. p.583-584.

Soil samples collected from 33 outcrops of weathered plutonic, hypabyssal, and volcanic rocks scattered along a 1400 km traverse from the West Antarctic coastline to the Polar Plateau were analyzed for clay mineral content. Clay minerals present (in approximate order of abundance) are "mica", chlorite, illite-smectite, smectite, kaolinite and vermiculite. The large amount of "mica" and/or chlorite in almost all host rocks and their associate soils, the small amount of clay (generally <1%) present in all soils, the weak development of most soil profiles, and the large amount of glass in the clay-sized fraction of soils developed on Tertiary basaltic rocks, indicate that physical weathering is the dominant process of weathering in this area. Smectite, vermiculite and illite-smectite are products of chemical weathering. Kaolinite in soils from the Thiel Mountains is unusual, because formation of this mineral is generally thought to require at least moderate amounts of leaching. It is suggested that kaolinite in Thiel Mountain soils is inherited from the saussuritised cores of plagioclase crystals in host granodiorite. (Auth.)

E-43430

Pankhurst, R.J., **Paleozoic and Andean magmatic arcs of West Antarctica and southern South America**, Plutonism from Antarctica to Alaska, edited by S.M. Kay and C.W. Rapela, Geological Society of America, Special paper, No.241, Boulder, CO, Geological Society of America, 1990, p.1-7, Refs. p.6-7.

The evolution of magmatic activity along the Pacific margin of southern South America and West Antarctica is considered in terms of the alignment, timing and petrogenesis of calc-alkaline granitoid emplacement. Distinct lower Paleozoic, upper Paleozoic to Triassic, and Triassic/earliest Jurassic belts in north-central Chile trend gradually across the continent into Argentina. Granitoids of similar ages also occur in the Antarctic Peninsula and adjacent parts of West Antarctica, although their linear distribution is not well known. These early granitoids were derived from magmas that contained a significant component of the deep continental crust close to the zone of melting. The Paleozoic belts are transected by mid-Jurassic to Tertiary plutonic belts, which are parallel to the Pacific coast throughout the region. The initial Sr-87/Sr-86 ratios of these younger granitoids decrease with time, suggesting a diminishing continental input, perhaps due to deeper melting in the mantle during extensional phases in a migrating subduction regime.

E-43431

Harrison, S.M., Piercy, B.A., **Evolution of the Antarctic Peninsular magmatic arc; evidence from northwestern Palmer Land**, Plutonism from Antarctica to Alaska, edited by S.M. Kay and C.W. Rapela, Geological Society of America, Special paper, No.241, Boulder, CO, Geological Society of America, 1990, p.9-25, Refs. p.23-25.

Northwestern Palmer Land is situated within the Mesozoic magmatic arc of the Antarctic Peninsula. Three temporally distinct granitoid groups, of lower Paleozoic, Jurassic, and Cretaceous ages, have been identified in this region. They are all calc-alkaline, I-type gra-

nitoids, ranging from quartz-diorites to granites, have high LIL/HFS element ratios, and their analyses all fall in the volcanic arc granite field when plotted on granite discrimination diagrams. The Paleozoic group comprises orthogneisses that have undergone high-grade metamorphism. The Jurassic group is variably foliated and partially recrystallized. The Cretaceous granitoids, which are undeformed, were subdivided on the basis of petrography into granophyric granites and nongranophyric granitoids. The orthogneisses are part of the extensive Paleozoic plutonism that occurred along the length of the Pacific margin of Gondwanaland. Within the context of the Antarctic Peninsula as a whole, the Jurassic granitoids are geographically more restricted and geochemically more variable than the Cretaceous granitoids. The latter form a geochemically uniform group of plutons that occur throughout the Antarctic Peninsula. (Auth. mod.)

E-43460

Spörli, K.B., **Earth science research in Antarctica, an Auckland perspective**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.7-12, 24 refs.

Earth science research in Antarctica is considered important for New Zealand because the Transantarctic Mountains and Marie Byrd Land were once continuous with New Zealand and share part of its geological history; because the geological record allows a model of the role of Antarctica in the global weather patterns to be constructed; and because the Ross Sea shores provide relatively undisturbed control for monitoring pollution in the southern ocean. New Zealand scientists' contribution to research in Antarctica, especially in the geological mapping of the Transantarctic Mountains, is reviewed. (Auth. mod.)

E-43481

Milne, A.J., Millar, I.L., **Significance of mid-Palaeozoic basement in Graham Land, Antarctic Peninsula**, *Geological Society of London. Journal*, 1989 146(2), p.207-210, 22 refs.

A mid-Palaeozoic basement to the Antarctic Peninsula is confirmed by a geochronological study of the gneissose country rock of the Mesozoic magmatic arc of eastern Graham Land. Rb-Sr whole-rock ages of 410 and 426 Ma from samples of orthogneiss indicate a previously unrecognized episode of granitic magmatism in the Antarctic Peninsula during the Silurian. Sm-Nd data on garnet-whole-rock pairs indicate that subsequent amphibolite facies metamorphism occurred in late Carboniferous times, probably as a result of plutonism. (Auth.)

E-43491

Jull, A.J.T., Donahue, D.J., Linick, T.W., Wilson, G.C., **Spallogenic C-14 in high-latitude rocks and in antarctic meteorites**, *Radiocarbon*, 1989 31(3), p.719-724, 28 refs.

C-14 in high-altitude rocks and in antarctic meteorites of long terrestrial age has been found at levels consistent with *in-situ* production by cosmic rays. Levels of 0.2-0.59 dpm/kg (or 1.0-2.6 x 1,000,000 C-14/g) are found in high-altitude samples ranging from 3300 to 5460 m. Similar values are observed in antarctic meteorites that have been dated by Kr-81 by Freundel, Schultz & Reedy (1986) as over 100 kyr old. (Auth.)

E-43495

Bockheim, J.G., Ugolini, F.C., **Review of pedogenic zonation in well-drained soils of the southern circumpolar region**, *Quaternary research*, July 1990 34(1), p.47-66, 60 refs.

The concept of zonality is used to link well-drained mineral soils and processes along a bioclimatic gradient extending from ca. 48 to

87S, including southernmost Chile, the subantarctic islands, and maritime and continental Antarctica. The following environmental factors decline along this gradient: mean annual temperature and precipitation and the type and number of plant species. Six pedological zones (along with representative soils) are identified along the gradient: (1) Subantarctic Forest Zone (Podzol?), (2) Subantarctic Low Tundra zone, (3) Subantarctic High Tundra Zone (Subantarctic Brown soil, without permafrost), (4) Antarctic Sub-Polar Desert Zone (Subantarctic Brown soil, with permafrost), (5) Antarctic Polar Desert Zone (Red Ahumisol), and (6) Cold Desert Zone (Ahumisol). Zonal mineral soils in the Subantarctic Forest and Low Tundra Zones are rare, because large amounts of precipitation (over 2500 mm) and cool summers have led to thick accumulations of peat. Whereas the processes of rubification, melanization, and peat accumulation decline in relative magnitude southward, the processes of salinization and desert pavement formation increase in relative importance along this bioclimatic gradient. Carbonation and perversion (silt and clay migration) are maximized in the Subantarctic Tundra and Antarctic Polar Desert Zones. Because of the limited amount of land between 40 and 65S and the presence of the Antarctic Convergence, comparable pedogenic zones occur at lower latitudes in the Southern than in the Northern Circumpolar Region. (Auth.)

E-43496

Koeberl, C., Cassidy, W.A., **Differences between antarctic and non-antarctic meteorites: an assessment**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.3-18, Refs. p.15-18.

The reality of numerous differences between antarctic and non-antarctic meteorites has now been established beyond doubt; however, the main question regarding the cause of these differences remains. It seems that they have a wide variety of origins, ranging from pre-terrestrial traits to collection (recovery) effects and terrestrial weathering. Studies of terrestrial weathering have shown that, over the long time the meteorites spend in and on the ice, even subtle processes can produce substantial effects. Not all differences between the antarctic and non-antarctic meteorite populations can be explained by weathering, pairing, or different collection procedures. Variable trace element abundances and distinct differences in the thermal history and thermoluminescence characteristics have to be interpreted as being pre-terrestrial in origin. Such differences imply the existence of meteoroid streams, whose existence poses problems in the framework of the current knowledge of celestial mechanics. However, several independent studies support the existence of such meteoroid streams, thus being consistent with the suggestion of a time-variable influx of extraterrestrial material to Earth. The generally smaller average size of antarctic meteorites may be the cause for the different meteorite-type frequency and the higher abundance of rare samples, because smaller meteorites may come from a slightly different parent population. In this paper the contributions in this series are summarized and a review is provided of the current state of the question for the reality and cause of differences between antarctic and non-antarctic meteorites. (Auth. mod.)

E-43497

Lipschutz, M.E., Samuels, S.M., **Ordinary chondrites: multivariate statistical analysis of trace element contents**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.19-34, 50 refs.

Standard multivariate Discriminant Functions are used to compare contents of mobile trace elements (Co, Au, Sb, Ga, Se, Rb, Cs, Te, Bi, Ag, In, Tl, Zn, Cd) in various populations of L4-6 or H4-6 chondrites. To aid the analysis a non-standard Randomization-

Simulation method was developed that permits probability assignments on a distribution-free basis. Because the sample database for antarctic L4-6 chondrites is very limited, it could not be established that mildly and strongly shocked populations differ compositionally. For non-antarctic L4-6 chondrites a highly significant compositional difference is evident. This difference probably reflects shock-induced loss of mobile trace elements from parent material of the strongly shocked population. It is believed that the case for compositional difference between antarctic and non-antarctic H4-6 chondrite populations, as well as between these populations of L4-6 chondrites, is now conclusively established. Various lines of evidence demonstrate that for various sorts of meteorites, especially H4-6 chondrites, the antarctic/non-antarctic compositional difference is not due to trivial (terrestrial) causes but rather to preterrestrial differences in the genesis of their parent materials. (Auth. mod.)

E-43498

Takeda, H., **Comparisons of antarctic and non-antarctic achondrites and possible origin of the differences**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.35-47, 43 refs.

Investigations of pairs of Yamato achondrites using mineralogical techniques resulted in a number of distinct groupings which suggested that differences between the antarctic and non-antarctic achondrites largely depends on detection of pairings of the antarctic specimens. The pairings of the specimens from Victoria Land have not been as well characterized as those of the Yamato Mountains. Comparisons with non-antarctic meteorites show that the antarctic HEDs and ureilites differ from non-antarctic specimens by the following criteria: polymict eucrites excluding those with howarditic affinity have not been found in the non-antarctic collections. Magnesian ureilites and augite-bearing ureilites were found only in Antarctica. Differences may not be attributed to just one factor. The evidence of two unique diogenite falls preserved on the restricted ice fields suggests that the Yamato diogenites may represent falls on restricted areas in the distant past. The discovery of many small unique eucrites and ureilites suggests that within the large number of small specimens on a bare ice field there is a higher chance of finding unique varieties. (Auth. mod.)

E-43499

Grady, M.M., Wright, I.P., Pillinger, C.T., **Comparisons between antarctic and non-antarctic meteorites based on carbon isotope geochemistry**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.49-58, 42 refs.

The whole-rock C isotopic composition of a suite of ordinary chondrites indicates that there is a difference between antarctic and non-antarctic meteorites. However, this apparent distinction is not due to an inherent difference in the meteorite source populations, but is rather a result of the presence of antarctic weathering products, mainly bicarbonates, which affect the overall $\delta C-13$ of these meteorites. When these weathering products are removed, either by acid-washing or combustion to 500 C, the perceived division also disappears, leading to the conclusion that ordinary chondrites (both Antarctic and non-Antarctic) have similar $\delta C-13$ values. The almost ubiquitous occurrence of weathering products with distinctive C isotopic composition highlights the importance of removing all terrestrial contaminants from meteorites with low indigenous C budgets before attempting any interpretation concerning their C abundance or isotopic composition. The C chemistry of Cl, CM, and CR chondrites is also subject to problematic interpretation. Whilst the indigenous C abundance is too high to be compromised by the addition of terrestrial weathering products, the inhomogeneous distribution of an array of

components with widely varying isotopic signatures leads to a random distribution of $\delta^{13}\text{C}$ values. Analyses of individual components (insoluble macromolecular material, carbonates, and silicon carbide) reveal that there are no gross differences in C chemistry between antarctic and non-antarctic chondrites. The few distinctions that do exist might readily be explained by weathering or isotopic exchange in antarctic types. Whilst not forming a separate population, antarctic carbonaceous chondrites may extend the range of properties of non-antarctic chondrites beyond the currently known limits. (Auth. mod.)

E-43500

Schultz, L., Weber, H.W., Bergemann, F., **Noble gases in H-chondrites and potential differences between antarctic and non-antarctic meteorites**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.59-66, 30 refs.

Thirty-one antarctic H-chondrites from the Allan Hills have been analyzed for their noble gases. Seven of the specimens contain solar gases; thirteen have a cosmic-ray exposure age around 8 Ma. Both fractions are as observed for H-chondrites from the rest of the world. Scrutiny of the data for "paired samples" yields a minimum number of 17 independent falls, with 6 falls required for the 8 Ma peak of exposure age. The distribution of exposure ages as well as that of radiogenic He-4 and Ar-40 yield no evidence that H-chondrites from the Allan Hills region represent a mixture of populations that is different from that brought to moderate latitudes of the Earth in more recent times. (Auth.)

E-43501

Velbel, M.A., Long, D.T., Gooding, J.L., **Terrestrial weathering of antarctic stone meteorites: formation of Mg-carbonates on ordinary chondrites**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.67-76, 60 refs.

White efflorescences of weathering origin occur superposed on fusion crusts, or along fractures in the interiors, of approximately 5% of all meteorites in the US antarctic collection. Efflorescences from equilibrated ordinary chondrites consist of the hydrous Mg-carbonates nesquehonite (+/- hydromagnesite). X-ray diffraction and scanning electron microscope studies of efflorescences from LEW 85320 (H5) show abundant elongate prismatic crystals of nesquehonite (idiomorphic, not pseudomorphous after lansfordite), with minor local encrustations of hydromagnesite. Abundances of Na, K, Ca, and Rb in efflorescences from LEW 85320 suggest that the observed contents of these elements would require only modest fractionation of chondritic composition, whereas extensive fractionation would be required to derive the observed cation ratios from terrestrial sea-salts. Therefore, cations in evaporite minerals on antarctic meteorites are most likely not products of contamination by terrestrial (marine) salts. The Mg in the efflorescences probably originated from weathering of meteoritic olivine; other cations in the efflorescences are also of meteoritic provenance. (Auth. mod.)

E-43502

Mittlefehldt, D.W., Lindstrom, M.M., **Generation of abnormal trace element abundances in antarctic eucrites by weathering processes**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.77-87, 50 refs.

Based on REEs, antarctic eucrites can be divided into two groups: those showing normal trace element characteristics and those showing abnormal trace element abundances. Many antarctic eucrite, polymict eucrite, and basaltic clast samples show the abnormal trace ele-

ment abundances with REE patterns exhibiting positive Ce anomalies, positive Eu anomalies, and low abundances of the remainder of the REEs, with the LREEs generally being at lower relative abundances than the HREEs. Most samples of crystalline clasts from the polymict eucrites LEW85300, LEW85302, and LEW85303 show the abnormal patterns, while the glassy matrixes of these meteorites show normal patterns. Exterior samples generally show more abnormal patterns (larger anomalies, greater depletions) than interior samples from the same meteorites. Comparison of all basaltic eucrite literature data combined with the authors' data shows that positive and negative Ce anomalies and positive Eu anomalies are found in about 61% of antarctic eucrite analyses, and are virtually unknown in non-antarctic eucrite analyses. Further, positive Ce anomalies and positive Eu anomalies are commonly associated with antarctic eucrites having low REE concentrations. Consideration of mineral/melt partition coefficients shows that it is unlikely that Ce anomalies are magmatic features from the HED parent body. Cerium anomalies on earth are generally restricted to the weathering zone, where the relative ease of oxidizing Ce to the +4 state allows for fractionation of Ce from the +3 REEs. (Auth. mod.)

E-43503

Miyamoto, M., **Differences in the degree of weathering between antarctic and non-antarctic meteorites inferred from infrared diffuse reflectance spectra**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.89-98, 43 refs.

Infrared diffuse reflectance spectra were measured for antarctic and non-antarctic meteorites to compare the degree of terrestrial weathering by using the integrated intensity of absorption bands near 3 microns caused by hydrous minerals, and the intensity of absorption bands near 7.4 microns, probably caused by hydrous carbonates. Non-antarctic ordinary chondrite finds usually show large values of the integrated intensity of the 3 micron band, whereas non-antarctic ordinary chondrite falls show small intensities. Some antarctic ordinary chondrites are as fresh as non-antarctic 3 micron band, although the degree of weathering on the A-B-C scale is reported to be A. Weathering-produced hydrous carbonates seem to be ubiquitous in antarctic ordinary chondrites, because the spectra of all the antarctic ordinary chondrites measured show the presence of the 7.4 micron band. Non-antarctic ordinary chondrite falls show very weak 7.4 micron bands, suggesting only little weathering-produced hydrous carbonates. Diffuse reflectance spectra were also measured for the mixtures of akaganéite, goethite, artinite, or calcite with the Nuevo Mercurio (H5) ordinary chondrite to examine spectral changes and to compare them with those of meteorites. Absorption bands near 7 microns of diffuse reflectance spectra are sensitive to the presence of carbonates. (Auth.)

E-43504

Cassidy, W.A., Harvey, R.P., **Are there real differences between Antarctic finds and modern falls meteorites**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.99-104, 13 refs.

Recent reports of differences between antarctic and non-antarctic meteorite collections include some based on mass frequency distributions and relative abundances of types. Using the modern falls of Harvey and Cassidy (1989) as a model of what a meteorite collection free of post-fall processing should be like, the relative abundance of different types of stony meteorites for the antarctic finds and the modern falls was compared. Reconstructing the antarctic mass-frequency distributions by using a model based on field observations of antarctic meteorite loss due to weathering, wind transport, and search inefficiencies, the authors created an idealized antarctic meteorite

mass frequency distribution that is identical in shape (essentially log-normal) to the modern falls. In using the model no difference was found between the antarctic finds and modern falls, within reasonable estimates of error. (Auth.)

E-43505

Huss, G.R., **Meteorite mass distributions and differences between antarctic and non-antarctic meteorites**, *Geochimica et cosmochimica acta*, Jan. 1991 55(1), Workshop on Differences Between Antarctic and Non-Antarctic Meteorites, Vienna, Austria, July 1989, p.105-111, 18 refs.

Meteorite mass distributions provide important insight into real and apparent differences between antarctic and non-antarctic meteorites. Antarctic meteorites are typically smaller than others, and represent a different portion of the mass distribution of infalling meteorites. This results from the different methods employed to acquire the collections, and from the much smaller effective collecting area for antarctic meteorites. Comparisons of the proportions and mass distributions of H and L chondrites for different ice fields suggest that previously reported high H to L ratio among antarctic meteorites compared to witnessed falls results from an unrecognized H5 shower fall that covered the Allan Hills Main and Near Western ice fields in the relatively recent past. The probable presence of unrecognized shower falls among the antarctic meteorites means that population statistics, even corrected for presently recognized pairing, cannot be used to support an earlier suggestion of a temporal variation in the mixture of meteorites arriving on Earth. (Auth.)

E-43532

Giret, A., **Typology, evolution, and origin of the Kerguelen Plutonic Series, Indian Ocean: a review**, *Geological journal*, July-Dec. 1990 25(3/4), p.239-247, 53 refs.

The Kerguelen Is. (6,500 sq km) are the third largest oceanic archipelago after Iceland and Hawaii. One of their most remarkable geological features is the existence of several igneous complexes thought to represent the deep levels of volcano-plutonic structures of which the upper part has been eroded. These plutonic bodies have ring shapes with diameters ranging from 1 to 15 km. The oldest (39-23 Ma) have transitional petrological features while the youngest (26 Ma-Recent) are typically alkaline. This sequence is also observed in the surrounding flood-basalts. Both the basalts and the plutonic rocks have a mantle origin. The alkaline plutonic suites evolve towards silica-oversaturated or -undersaturated rock types depending on whether they are located to the west or to the east of NNW-SSE boundary. The divergence in alkaline trends may be related to magmatic differentiation or linked to the evolution of two different initial magmas, one being mid-alkaline and the other high-alkaline. In both hypotheses fluids, particularly H₂O, play a major role. (Auth.)

E-43534

Yanai, K., ed, **Proceedings of the Fourteenth Symposium on Antarctic Meteorites**, Tokyo, National Institute of Polar Research, 1990, 286p., Refs. passim. For selected papers see E-43535 through E-43549.

This volume is the Proceedings of the Fourteenth Symposium on Antarctic Meteorites which was held on June 6-8, 1989, at the National Institute of Polar Research (NIPR), Tokyo. Seventy-five scientific papers were presented, and 67 papers were read at the symposium; twenty papers are included in this volume of the proceedings. These papers cover various subjects such as petrology, mineralogy, chemical studies, isotope studies and physical studies on antarctic and non-antarctic meteorites. The volume consists of two parts. To part A are assigned reports of two consortium studies: lunar meteorites and chondrites of CI affinity. The papers of part B present general topics on antarctic meteorites and related subjects. (Auth.)

E-43535

Koeberl, C., Kurat, G., Brandstätter, F., **Lunar meteorite Yamato-86032: mineralogical, petrological, and geochemical studies**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.3-18, 34 refs.

Yamato-86032 is a shock-lithified anorthositic fragmental breccia. It consists mainly of highly feldspathic meta-breccias and meta-meltrocks and possibly contains a small contribution from mare lithologies, but there is no indication of a KREEP component. In many respects Y-86032 is similar to the previously described lunar meteorites Y-82191/3, but there are some notable differences. Analysis has been done on about 40 major and trace elements in bulk matrix, impact melt, and clast samples from two chips of Y-86032. The abundances of most lithophile and incompatible elements are lower in Y-86032 than in Y-82192. The REE abundances are comparable to those of Y-82192. The elements Sc, Cr, Mn, Fe and Co have significantly lower abundances than in Y-82192, and the siderophile element pattern is also different. Since cosmic ray exposure data indicate pairing of Y-86032 with Y-82192/3, the source region for these meteorites on the moon must have been fairly heterogeneous. (Auth.)

E-43536

Wang, M.S., Lipschutz, M.E., **Labile trace elements in lunar meteorite Yamato-86032**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.19-26, 13 refs.

Contents of siderophile Au, Co and Sb, mobile Ag, Bi, Cd, In, Se, Te, Tl and Zn and lithophile Cs, Ga, Rb and U were determined by RNAA in samples of the lunar meteorite (anorthositic breccia) Yamato (Y)-86032. Contents of the 4 lithophiles in matrix (75AM) and anorthositic clast (101AC) are similar to those in samples of the other 3 lunar meteorites. This is consistent with all these anorthositic breccias being from the lunar highlands. Contents of the other 11 elements indicate a micrometeorite component of 2.5% (Cl-equivalent) in the parent regolith of Y-86032,75AM. This value is unusual for lunar samples, and is virtually identical to the value for the paired samples Y-82192/3 found in the same bare ice region, suggesting that these 3 specimens derive from the same lunar region in the same impact. No micrometeorite component is detectable in Y-86032,101AC. Slight compositional differences between Y-82192/3 and Y-86032 indicate that they did not travel Earthward as a single rock. Allan Hills-81005 and Y-791197 each exhibit characteristic siderophile/mobile element patterns indicating deviation from different parent regions in separate events. Hence, the 5 lunar meteorites studies thus far derive from 3 distinct impacts. (Auth.)

E-43537

Grady, M.M., Pillinger, C.T., **Carbon and nitrogen stable isotope geochemistry of two lunar meteorites: ALHA-81005 and Y-86032**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.27-39, 47 refs.

The carbon and nitrogen stable isotope geochemistry of two lunar meteorites, ALHA-81005 and Y-86032, has been compared with that of an Apollo 16 regolith breccia, 60016. Although much of the carbon present in all three samples is terrestrial organic contamination, the meteorites have higher carbon abundances and lighter isotopic compositions than 60016. The non-contaminant carbon in ALHA-81005 and Y-86032 occurs as two distinct components, combusting between 550-700 C and 900-1100 C. Since these components are absent from the pristine lunar breccia, they must have been added from the impactor which ejected the meteorites from the Moon; added in the Antarctic; or be representative of a lunar environment not sampled by Apollo missions. At temperatures over 1100 C, spallogenic car-

bon combusts, with elevated $\delta^{13}\text{C}$, greater than 0 per mill. Nitrogen systematics are less well resolved than carbon, partly due to the lower amounts of nitrogen gas liberated by the meteorites. Nitrogen abundance of ALHA-81005 and Y-86032 falls in the range of values from lunar breccias, and $\delta^{15}\text{N}$ values follow the heavy-light-heavy pattern characteristic of such samples. Spallogenic carbon and nitrogen are more abundant in ALHA-81005 than Y-86032, in keeping with its longer exposure age. Nitrogen data are consistent with identification of ALHA-81005 and Y-86032 as lunar highland breccias compacted from immature regolithic material. (Auth.)

E-43538

Tomeoka, K., **Mineralogy and petrology of Belgica-7904: a new kind of carbonaceous chondrite from Antarctica**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.40-54, 24 refs.

A mineralogical and petrological study of Belgica-7904 (B-7904) shows that it can be classified into the CM group. B-7904 has a variety of chondrules and aggregates, where pyroxenes and mesostasis glass are completely replaced by phyllosilicates, but olivine remains little altered. It has a high abundance of troilite; most occur in submicron to micron grains dispersed in the matrix. Minor taenite occurs, but magnetite is rare and tochilinite is absent. The phyllosilicates have relatively high Na contents and lower $(\text{Mg} + \text{Fe})/(\text{Si} + \text{Al})$ ratios than serpentine; thus, they may be intergrowths of serpentine and a smectite-like phyllosilicate. Microprobe analyses of the phyllosilicates show high analytical totals relative to ordinary phyllosilicates, being consistent with the idea that they were dehydrated by heating. B-7904 and Y-86720 are mineralogically similar, although the former is less affected by aqueous alteration than the latter. They were probably derived from similar precursors and experienced aqueous alteration and thermal metamorphism in a common environment. These meteorites and ordinary CM chondrites apparently experienced distinct alteration histories, suggesting that they came from different regions in a parent body or different parent bodies. (Auth.)

E-43539

Akai, J., **Mineralogical evidence of heating events in antarctic carbonaceous chondrites, Y-86720 and Y-82162**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.55-68, 28 refs.

Antarctic carbonaceous chondrites Y-82162 and Y-86720 were examined by transmission electron microscopy. Matrix phyllosilicates in both meteorites are probably serpentine and saponite. There is evidence that these phyllosilicates were affected by thermal metamorphism. The serpentine was almost completely transformed to olivine or an intermediate phase between serpentine and olivine. The degrees of thermal metamorphism in Y-86720, Y-82162 and Y-793321 were compared, and heating experiments of terrestrial saponite and murchison CM chondrite were also carried out for detailed comparison. Based on these observations and experiments, estimated degrees are as follows: $\text{Y-86720} > \text{Y-82162} > \text{Y-793321}$. (Auth.)

E-43540

Yamamoto, K., Nakamura, N., **REE characteristics of Yamato-82162 and -86720 meteorites and their inference to classification**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.69-79, 37 refs.

Abundance of REE, Ba, Sr, Rb, K, Mg, Ca and Fe were determined for Yamato-82162 and -86720 carbonaceous chondrites by mass spectrometric isotope dilution. The CI-normalized REE abundance patterns for Y-82162 are nearly flat, but show small negative Ce anomalies. A small fraction of the chondrite shows a clear light-heavy REE fractionation. The REE abundance patterns of Y-

86720 are also almost flat and show positive Eu anomalies. The degree of Eu anomaly seems to correlate with the absolute abundance of the REE. For the abundances of elements other than REE, Y-82162 shows enrichments of Fe and Mg and Y-86720 displays depletions of the relatively volatile elements K and Rb. From these results, the following conclusions are obtained: Y-82162 may contain a high temperature component formed in the nebula; Y-82162 is classified as a CI chondrite which has experienced thermal metamorphism; Y-86720 is composed of a refractory-rich component and a refractory-poor component; Y-86720 cannot be strictly classified into any group but is intermediate between CM and CO chondrites. (Auth.)

E-43541

Paul, R.L., Lipschutz, M.E., **Consortium study of labile trace elements in some antarctic carbonaceous chondrites: antarctic and non-antarctic meteorite comparisons**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.80-95, 41 refs.

Data are reported for Ag, Au, Bi, Cd, Co, Cs, Ga, In, Rb, Sb, Se, Te, Tl, U and Zn determined by radiochemical neutron activation analysis in consortium samples of B-7904, Y-82042, Y-82162 and Y-86720 carbonaceous chondrites. These trace elements cover a wide volatility/mobility range and give unique information on thermal histories of meteorites. The results indicate the unique nature of these carbonaceous chondrites. They also indicate substantial differences in the thermal histories of antarctic and non-antarctic C1 and C2 chondrite populations. From all that is known about the antarctic and non-antarctic meteorite populations, the overwhelming weight of evidence supports the view that these populations sample different extraterrestrial source materials, differing in thermal histories. It may be that over the extended collecting period of the antarctic ice sheet, it has sampled a considerably greater proportion of near-Earth asteroids than do current falls. (Auth.)

E-43542

Saito, J., Takeda, H., **Mineralogy of five new antarctic ureilites, LEW86216, LEW85328, Y-791839, Y-75154, Y-8448, and the origin of their chemical variations of pyroxene**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.132-146, 26 refs.

Mineralogical studies of mafic silicates in heavily shocked ureilites, LEW86216, Y-75154, Y-791839, and moderately shocked ureilite LEW85328 were performed to reveal the chemical variations and textures produced by shock events on the ureilite parent body. Y-8448 is one of the common ureilites, but is found in relatively small numbers in Antarctica. Olivines in Y-75154 and LEW86216 show granoblastic textures and the carbonaceous veins are disrupted. Their pyroxenes show chemical variations toward enstatite. They are among the most heavily shocked ureilites. Grain rims of Y-791839 and LEW85328 show chemical variations due to shock. The chemical trends of all these heavily shocked ureilites cover the entire range of known individual ureilites. Shock effects of these ureilites are interpreted to have been produced during the break-up of their parent body. Their chemical variations may be applied to study of the chemical differentiation by planetesimal-scale collision in the earliest stage of ureilite formation. (Auth.)

E-43543

Matsunami, S., Nishimura, H., Takeshi, H., **Chemical compositions and textures of matrices and chondrule rims of unequilibrated ordinary chondrites—II. Their constituents and the implications for the formation of matrix olivine**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.147-180, 36 refs.

The micron-size constituents of fine-grained matrices and chondrule rims in ten unequilibrated ordinary chondrites, several antarctic specimens among them, have been investigated in detail. Special emphasis is put on the mode of occurrence and mineral chemistry of micron-sized matrix olivine in six primitive type-3 ordinary chondrites having lower petrologic subtypes. Textural evidences concerning occurrence of matrix ferrous olivine observed in matrices of chondrite samples studied here seem to indicate that some of matrix intermediate to Fe-rich olivine would have formed through solid-solid reactions between matrix enstatite, silica-rich spherules and metallic Fe-Ni. It is shown that the MnO content increases remarkably with increasing FeO content, showing a strong positive correlation of Mn with Fe in matrix ferrous olivine. The ratios of MnO to FeO appear to be distributed around the solar ratio and lower than those of chondrule olivines. Although the solid-solid reaction hypothesis explains a wide variation of Fe mole % of matrix olivine, it is not clear whether reactions between matrix enstatite, silica-rich spherules and metallic Fe-Ni can explain the positive correlation of Mn with Fe in matrix ferrous olivine. Direct vapor to solid condensation is suggested as an alternative mechanism for the formation of matrix ferrous olivine. (Auth.)

E-43544

Murae, T., Masuda, A., Takahashi, T., **Spectroscopic studies of acid-resistant residues of carbonaceous chondrites**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.211-219, 31 refs.

Mass and IR spectra have been obtained of the acid-resistant residues resulting from HCl and HF treatments of ALH-77307 (C3). C-13 NMR spectra of the residues obtained by partial mineral dissolution with acid treatments of Yamato-791717 (C3) and Allende (C3) have been recorded under CP-MAS conditions. These spectral data were compatible with the polycyclic aromatic structure proposed for the major carbonaceous matter in carbonaceous chondrites by the authors. (Auth.)

E-43545

Miono, S., Ono, H., Kujirai, H., Yoshida, M., Nakanishi, A., **Terrestrial ages of antarctic meteorites measured by thermoluminescence of the fusion crust**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.240-243, 4 refs.

The acquired doses of 14 antarctic meteorites were measured using the thermoluminescent (TL) intensity of the fusion crust. It was found that there is a good correlation between the acquired TL doses and the terrestrial ages, which were previously measured by the cosmogenic radionuclide abundance. (Auth.)

E-43546

Ninagawa, K., Yamamoto, I., Wada, T., Matsunami, S., Nishimura, H., **Thermoluminescence study of ordinary chondrites by TL spatial distribution readout system**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.244-253, 23 refs.

The thermoluminescence (TL) image reading technique by the TL spatial distribution readout system is improved 1) to obtain a quantitative glow curve in any part of the TL image, 2) to get fine structure of a TL image and 3) to heat a sample to a higher temperature. This technique was applied to measure the natural and artificial TL glow curves of chondrules in ordinary chondrites, ALH-77294 (H5) and ALH-77216(L3.8). The fluctuation in the natural LT/HT (region) ratios (LT (region); photons counted in a low temperature region, HT (region); and in a high temperature region) of the equilibrated chondrite ALH-77294 are small, though that in the unequilibrated chondrite ALH-77216 is large. The equivalent doses of ALH-77294 and ALH-77216 can be estimated from the correlation between natural LT (region) and artificial LT (region) to be about 240 krad and 16 krad respectively, and are consistent with isotopic ages. (Auth.)

E-43547

Horii, Y., Fujii, N., Takeda, H., **Hardness analysis of metallic particles in ordinary chondrites**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.254-263, 16 refs.

Mechanical properties of metallic particles in four shock-melted and seven unshocked ordinary chondrites were studied by means of the Micro Vickers Hardness Measurement. Together with the morphological and mineralogical properties, they were used to characterize the shock effects in the chondrites. Average value of hardness in Fe-Ni particles is smaller (less hard) than that of troilite. Average values of hardness of taenite particles in Y-790964 (LL) and Y-75258 (LL6) are 144 and 348 kg/sq mm, respectively. The hardness increases as the Ni content increases. However, the range of hardness values in Fe-Ni particles shows little systematic change with the petrologic type. The fractal dimension of two-dimensional shape of metallic particles was measured by a personal-computer-aided image processing system. The Vickers hardness varies in some systematic way. In shock-melted LL chondrites, when the amount of vesicles increases, the average of hardness decreases. Shock effects are heterogeneous even on a microscopic scale, and irregular grains (with higher values of the fractal dimension) seem to show shock effects more strongly. (Auth.)

E-43548

Fireman, E.L., **Age of Yamato K-26 ice based on uranium-series disequilibrium**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.264-269, 12 refs.

The Ra-226, Th-230, U-234, and U-238 dissolved in two ice samples removed from a 20-kg block of Yamato ice with tephra band K-26 were measured. One sample, 1.50 kg of ice containing the band, had 252 mg of particulates; the other sample, 1.78 kg of ice outside the band, had 5.7 mg of particulates. The activities are disequilibrated in the 1.50-kg ice sample, with 0.0333 dpm/kg (decays per minute per kilogram of ice) of Ra-226, 0.0178 dpm/kg of Th-230, 0.0148 dpm/kg of U-234, and 0.0128 dpm/kg of U-238. On the other hand, these activities are equilibrated, being each 0.013 dpm/kg, in the 1.78-kg ice sample. The activities are also in equilibrium in the tephra. The tephra particles contribute a significant amount of Ra-226, a lesser amount of Th-230, a small amount of U-234, and no U-238 to the ice. The results are consistent with the idea that alpha decays in the small tephra particles cause daughter products to recoil into the ice. The age of the ice, based on the ratios of the daughter activity excesses in the 1.50-kg ice sample, is 38,000 years. This is the youngest terrestrial age of three lunar meteorites recovered 25 km north of the K-26 site. (Auth.)

E-43549

Hirano, T., **Observation of Allende and antarctic meteorites by monochromatic X-ray CT based on synchrotron radiation**, Symposium on Antarctic Meteorites, 14th, Proceedings, edited by K. Yanai, Tokyo, National Institute of Polar Research, p.270-281, 12 refs.

Three-dimensional CT images of the Allende meteorite with a high resolution of 10 microns have been obtained nondestructively by a monochromatic X-ray computed tomography (CT) based on synchrotron radiation (SR). The metallic minerals, matrix and chondrules can be clearly observed in the CT images. The CT values, which express the image intensity, allow a quantitative elemental analysis including such as difference in the metallic minerals, i.e., pentlandite and troilite, using the comparison of CT images and elemental images measured by a computer-aided microanalyzer (CMA). The three-dimensional CT images indicate that the metallic minerals surround some chondrules, and the largest chondrule has two humps and well-crystallized olivine in its center. These observations suggest that the three-dimensional SR-CT system is a useful method for identification of internal structures of stony meteorites. Additionally, information obtained from the CT images of antarctic meteorites confirms that the SR-CT system can be applied to classification of stony chondrites. (Auth.)

E-43563

Johnston, A.C., **Effect of large ice sheets on earthquake genesis, NATO ASI series. Series C, Mathematical and physical sciences**, 1989 Vol.266, NATO Advanced Workshop on Earthquakes at North-Atlantic Passive Margins: Neotectonics and Postglacial Rebound, May 1988, p.581-599, 43 refs.

DLC QE534.2.N38 1989

Two continent-scale ice sheets—Antarctica and Greenland—currently exist on earth. The interiors of both continents are virtually aseismic. Is this coincidental or does a causal connection exist between the two observations? An examination of this question is the subject of this paper. It is concluded that with a few reasonable assumptions, ice sheets will indeed inhibit earthquakes by stabilizing potentially seismogenic faults in the underlying brittle crust. This same mechanism may also provide an explanation for the intense late-glacial faulting in Fennoscandia reported elsewhere in this volume. (Auth.)

E-43565

Weisberg, M.K., Printz, M., Nehru, C.E., **Bencubbin chondrite breccia and its relationship to CR chondrites and the ALH85085 chondrite**, *Meteoritics*, Dec. 1990 25(4), p.269-279, Refs. p.278-279.

Bencubbin is an unclassified meteorite breccia which consists mainly of host silicate (about 40 vol.%) and host metal (about 60%) components. Rare (<1%) ordinary chondrite clasts and a dark xenolith (formerly called a carbonaceous chondrite clast) are also found. Bencubbin has a number of important chemical and isotopic characteristics in common with the major components in the CR (Renazzo-type) chondrites and the unique ALH85085 chondrite, which suggests that their major components may be related. These include: Mafic silicates that are similarly Mg-rich and formed in similar reducing environments; similarly low volatiles; TiO₂, Al₂O₃ and Cr₂O₃ contents are also similar; similar metallic FeNi compositions that sharply differ from those in other chondrites; remarkable enrichments in N-15; and similar oxygen isotopic compositions that lie on the same mixing line. Thus, the major components of the Bencubbin breccia are highly similar to those of the ALH85085 and CR chondrites and they may have all formed in the same isotopic reservoir, under similar conditions, in the CR region of the solar nebula. (Auth. mod.)

E-43566

Gooding, J.L., Aggrey, K.E., Muenow, D.W., **Volatile compounds in shergottite and nakhlite meteorites**, *Meteoritics*, Dec. 1990 25(4), p.281-289, 24 refs.

Antarctic meteorite samples were obtained from the Antarctic Meteorite Working Group and prepared at the Johnson Space Center. Those samples included Allan Hills specimens A77005 (ALH77005; shergottite) and A81001 (ALH81001; eucrite), as well as Elephant Moraine specimens A79001 (EETA79001; shergottite), and A79004 (EETA79004; eucrite). The three different igneous lithologies in EETA79001 (A, B, C) were sampled separately. Vacuum pyrolysis and quadrupole mass spectrometry were used to measure evolved-gas profiles and total concentrations of H₂O, CO₂, CO, SO₂, S₂, H₂S, HCl, Cl, and hydrocarbons in both exterior and interior samples of shergottites (ALHA77005, EETA79001, and Shergotty), a nakhlite (Nakhla), and ducrites (ALHA81001, EETA79004, and Pasamonte). Eucrites were analyzed as control samples to monitor effects of terrestrial weathering and contamination, relative to properties sought for the shergottite-nakhlite parent body. Traces of saturated and unsaturated hydrocarbons in some samples are most likely terrestrial contaminants. The indigenous volatile compounds indicate that the shergottite-nakhlite parent body was highly oxidizing, and supported aqueous geochemistry during at least part of its history. (Auth. mod.)

E-43567

Jarosewich, E., **Chemical analyses of meteorites: a compilation of stony and iron meteorite analyses**, *Meteoritics*, Dec. 1990 25(4), p.323-337, Refs. p.335-336.

A compilation of the chemical analyses of 241 stony and 36 iron meteorites is presented; 196 analyses were published previously, 81 are new. This compilation includes analyses of new falls, new finds, previously analyzed meteorites, previously analyzed meteorites with suspect values, analyses of separates and inclusions, and analyses of 53 stony and 29 iron meteorites from Antarctica, including one of the "lunar" type. Mean compositions of chondrite falls, finds, and antarctic chondrites are compared. References are listed for earlier published analyses, and an appendix provides an outline of the sampling procedures, sample preparation, and the analytical methods.

E-43570

LeMasurier, W.E., ed, Thomson, J.W., ed, **Volcanoes of the antarctic plate and southern oceans**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, 487p., Refs. passim. For individual papers see E-43571 through E-43578.

DLC QE538.V65

This volume attempts to present both a comprehensive overview of the south polar and subpolar volcanic provinces, and summary data on the status of knowledge of each volcano or volcano group. The volume is organized into 7 sections (A through G) covering in a clockwise manner the volcanic provinces of Antarctica and the subantarctic islands. Each section begins with a summary of the region represented and is followed by individual volcano descriptions as numbered subsections. Wherever possible, section coverage was assigned to express petrologic and/or tectonic coherence. All volcanoes that rest on oceanic crust are included in sections E, F, and G, but the plate tectonic setting of each of these sections is different. The continental volcano Gaussberg is included in section F because it lies geographically closer to the volcanoes of the Kerguelen Plateau than to any others, but no petrogenetic relationship is implied.

E-43571

LeMasurier, W.E., **Late Cenozoic volcanism on the antarctic plate: an overview**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.1-17, Refs. p.16-17.

DLC QE538.V65

Most characteristics of antarctic plate volcanic rocks are related to a stable, extensional plate tectonic environment and, to a lesser extent, to an eruptive environment that was frequently dominated by glacial ice. The purpose of this article is to provide a review of the major volcanic features and to guide the reader to specific sections within the volume for more detailed information and a full set of references. (Auth. mod.)

E-43572

Kyle, P.R., **McMurdo Volcanic Group, western Ross Embayment**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.19-145, Refs. p.139-145.

DLC QE538.V65

All Cenozoic volcanic rocks situated within the western Ross Embayment, in or adjacent to the Transantarctic Mountains, are here defined as belonging to the McMurdo Volcanic Group. "Ross Embayment" is an informal but widely used designation to describe the combined area covered by the Ross Sea and the Ross Ice Shelf. They represent one of the most extensive alkali volcanic provinces in the world, comparable in extent to the alkali volcanic rocks in the East African rift systems. Twenty-seven volcanic centers within the McMurdo Volcanic Group are described. The centers vary from small single vents such as Mount Early to large volcanic fields composed of numerous eruptive vents such as Mount Melbourne. The 27 centers have been divided into four sections: the Hallett volcanic province, the Melbourne volcanic province, the Erebus volcanic province, and vents in the southernmost Ross Embayment.

E-43573

LeMasurier, W.E., Kawachi, Y., Rex, D.C., Wade, F.A., **Marie Byrd Land**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.147-255, Refs. p.253-255.

DLC QE538.V65

The volcanoes of Marie Byrd Land form a coherent province, distinctively marked by its petrologic characteristics and its spatial and chronologic patterns of volcanic evolution. It lies along a 900 km segment of the Pacific coast of Antarctica and is comparable in size to the Cascade volcanic chain of North America. The province is highly alkaline, bimodal, sodic, and dominated by basaltic rocks, but includes a broad spectrum of felsic differentiates. The term felsic is used in a general sense in this section to include all trachytes, phonolites, rhyolites, pantellerites, and comendites. There are 18 large central volcanoes and more than 30 small satellitic volcanic centers in the Marie Byrd Land Province. For descriptive purposes, these are grouped into the 16 individual volcano descriptions; an index map shows the location and map coverage of each. At least two of the major volcanoes are probably active, and three are regarded as possibly active, but no eruption has been directly observed. (Auth. mod.)

E-43574

Rowley, P.D., **Alexander Island, Palmer Land, and Ellsworth Land**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.257-301, Refs. p.299-301.

DLC QE538.V65

The Upper Cenozoic volcanic rocks exposed in Alexander I., Palmer Land, and Ellsworth Land are referred to informally here as the Bellingshausen volcanic province, although they are a geographical group rather than a volcanic entity. The province extends for 1600 km along the Pacific coast of West Antarctica, and contains some of the least accessible and most poorly known areas in Antarctica. Cenozoic volcanic rocks are widely scattered in the province, and most of the exposures are small, isolated, and badly eroded, suggesting that they are pre-Quaternary; original volcanic landforms are preserved in few places. The locations of most volcanic centers are unknown, and they are probably largely under ice. Few volcanoes are named except for those in the Hudson Mountains. Sizable volcanic fields occur only in the Hudson Mountains, in the Jones Mountains, and at several places on Alexander I. Individual volcano descriptions are listed from north to south. The region is incompletely surveyed, and detailed elevation data for snow surfaces and rock exposures are sparse. Most Cenozoic volcanic rocks in the province occur at elevations of less than 1250 m above sea level. (Auth. mod.)

E-43575

Smellie, J.L., Baker, P.E., Thomson, J.W., **Graham Land and South Shetland Islands**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.303-359, Refs. p.355-359.

DLC QE538.V65

Graham Land contains numerous outcrops of upper Cenozoic volcanic rocks, mostly restricted to northern and eastern areas. The region is unique in Antarctica in containing major changes in tectonic environment, which occurred over a short period during the Neogene-Recent, within a geographically limited area. These changes resulted in the concurrent eruption of compositionally contrasting magma types (e.g., volcanic arc (calc-alkaline) and within-plate (alkaline)). "Transitional" magmas showing a variety of arc, ocean ridge, and within-plate compositional characteristics were erupted during the formation of a small ensialic marginal basin in Bransfield Strait. The arc volcanism described in this province is possibly restricted to the Neogene period, but it may also overlap in part with the earliest within-plate volcanism; marginal-basin volcanism occurred concurrently with the latest stages of the within-plate volcanism. The outcrops are assigned a Neogene-Recent age, principally on the basis of isotopic ages and preservation of original volcanic landforms. (Auth. mod.)

E-43576

Baker, P.E., **South Sandwich Islands**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.361-395, 23 refs.

DLC QE538.V65

The South Sandwich Is. constitute a young and relatively small island arc extending over a distance of about 350 km along the eastern margin of the Scotia Sea. The Scotia Sea has developed by successive episodes of back-arc extension over the past 30 m.y. The most recent is that of the Scotia Sea Rise or South Sandwich spreading center which forms the western boundary of the small South Sandwich plate. The South Sandwich Is. are built on oceanic crust created at the back-arc spreading center over the past 8 m.y. The south Sandwich plate advances eastward at 70 mm/yr. Extensive ridge-transform offsets between the South Sandwich Is. and the South Atlantic triple junction mean that younger lithosphere is being subducted beneath the southern part of the island arc. Changes in the characteristics of the lithosphere may account for some of the north-south variation in seismicity, but do not appear to exercise any obvious influence on the geochemistry of the volcanic rocks. There are 11 main islands in the group, together with a number of islets and isolated rocks. About 10 km to

the east of the islands lies the axis of the South Sandwich Trench. (Auth. mod.)

E-43577

Verwoerd, W.J., Chevallier, L., Thomson, J.W., **Oceanic islands on the antarctic plate**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.397-463, Refs. p.457-463.

DLC QE538.V65

This section describes a widely scattered group of oceanic islands on the antarctic plate. Six individual volcanic islands and three archipelagoes, Crozet, Kerguelen and the McDonald Islands, lie between Antarctica and the southwest and southeast Indian Ocean ridges. Balleny and Scott Islands are located 250-300 km northeast and northwest, respectively, of Victoria Land. Peter I I. is located in the Bellingshausen Sea. Although Gaussberg, on the antarctic continent itself, is not an oceanic island volcano, it is compositionally unlike any other volcano on the antarctic plate, and it is included because it cannot be grouped conveniently with any of the volcanoes described in the other sections. All the islands are uninhabited except by temporary scientific personnel. Their physical volcanology, petrology and geochemistry, comparative geochronology and tectonic relationships are discussed. (Auth. mod.)

E-43578

Gamble, J.A., Thomson, J.W., Adams, C.J., Morris, P.A., Varne, R., **Subantarctic volcanoes of the Pacific plate**, *American Geophysical Union. Antarctic research series*, 1990 Vol.48, Volcanoes of the antarctic plate and southern oceans, edited by W.E. LeMasurier and J.W. Thomson, p.465-481, Refs. p.480-481.

DLC QE538.V65

Individual volcano descriptions are given of remote and relatively inaccessible volcanic islands which, except for Macquarie I., are all located on the Campbell Plateau, a vast area of shallow epicontinental ocean that has geological and structural links to the continental mass of New Zealand. Macquarie I., located to the southwest of Campbell Plateau, is the exposed part of the Macquarie Ridge, which formed as a result of oblique compression between the Indian-Australian and Pacific plates. Antipodes I. is composed of a sequence of coalesced scoria cones and tuff cones, and the Auckland Is. and Campbell I. are intraplate shield volcanoes. Basement to the Auckland Is. volcanoes is the Late Cretaceous granitoid exposed in the heart of Carnley Harbour, whereas the volcanic rocks of Campbell I. are underlain by a sequence of Late Mesozoic sedimentary rocks that rest unconformably on schist of presumed Lower Paleozoic age. No pre-Cenozoic basement has been observed on Antipodes I. Macquarie I., an ophiolite complex, is a rare example of uplifted oceanic crust. (Auth. mod.)

E-43609

Kyle, P.R., Meeker, K., Finnegan, D., **Emission rates of sulfur dioxide, trace gases and metals from Mount Erebus, Antarctica**, *Geophysical research letters*, Nov. 1990 17(12), p.2125-2128, 22 refs.

SO₂ emission rates have been measured annually since 1983 at Mount Erebus by correlation spectrometer (COSPEC V). Following a four-month period of sustained strombolian activity in late 1984, SO₂ emissions declined from 230 Mg/day in 1983 to 25 Mg/day and then slowly increased from 16 Mg/day in 1985 to 51 Mg/day in 1987. Nine sets of filter packs containing particle and Li-7OH treated filters were collected in the plume in 1986 and analyzed by neutron activation. Using the COSPEC data and measured element/S ratios on the filters, emission rates have been determined for trace gases and metals. It is inferred that HCl and HF emissions in 1983 were about 1200 and

500 Mg/day, respectively. Mt. Erebus has therefore been an important source of halogens to the antarctic atmosphere and could be responsible for excess Cl found in central Antarctica snow. (Auth.)

E-43620

Zeller, E.J., Dreschhoff, G.A.M., Thoste, V., **Uranium resource evaluation in Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, p.95-116, Refs. p.115-116.

Radiometric surveys for uranium resource evaluation are reported, which included 4 areas in the Transantarctic Mountains, a part of Marie Byrd Land, the Ellsworth Mountains, and the Antarctic Peninsula. It was originally assumed that only ratios of equivalent thorium/equivalent uranium or potassium/equivalent uranium could be reliably determined because these measurements are relatively insensitive to variations in detector-outcrop distance, counting geometry, and partial shielding by intergranular ice or light snow cover. However, from this survey it is found that the airborne radiometric data provide a reproducible and essentially accurate measure of the distribution and, within the limits of counting statistics, the absolute abundance of uranium, thorium, and potassium in the outcrops surveyed. Thus far, numerous significant radiation anomalies have been detected and several extensive occurrences of both uranium and thorium minerals have been found. Accumulations of uranium and thorium in pegmatites containing rare earth elements were also located by the radiometric surveys. (Auth. mod.)

E-43624

Beggs, J.M., Challis, G.A., Cook, R.A., **Basement geology of the Campbell Plateau: implications for correlation of the Campbell Magnetic Anomaly System**, *New Zealand journal of geology and geophysics*, 1990 33(3), p.401-404, 25 refs.

Two classes of basement rock are recognized on the Campbell Plateau: silicic to intermediate plutonic rocks, and quartzose metasedimentary rocks. Metasedimentary rocks from Campbell I., the sea floor near Bounty Is., and petroleum wells Kawau-1A, Hoiho-1C, and possibly Rakiura-1, are comparable with early Paleozoic metasedimentary rocks on the West Coast of South I., as well as Robertson Bay Group of northern Victoria Land and other antarctic suites, and basement from DSDP hole 281 on the South Tasman Rise. They are distinct compositionally from late Paleozoic and Mesozoic metasedimentary rocks of eastern New Zealand (Caples and Torlesse terranes). Magnetic anomalies on the Campbell Plateau (Campbell Magnetic Anomaly System) have previously been correlated with the Stokes Magnetic Anomaly system. Since Caples and Torlesse rocks lie immediately north and east of the Stokes Magnetic Anomaly System throughout onshore New Zealand, but quartzose metasedimentary rocks occur both south and north of the Campbell Magnetic Anomaly System on the Campbell Plateau, these anomaly systems cannot follow the same tectonic terrane boundaries. Therefore the Campbell Magnetic Anomaly System should not be correlated with the Stokes Magnetic Anomaly System, weakening the basis for the Campbell Fault, which has been postulated to offset the two anomaly systems. (Auth. mod.)

E-43625

Woolfe, K.J., Long, J.A., Bradshaw, M.A., Harmsen, F.J., Kirkbride, M.P., **Fish-bearing Aztec Siltstone (Devonian) in the Cook Mountains, Antarctica**, *New Zealand journal of geology and geophysics*, 1990 33(3), p.511-514, 23 refs.

Outcrops of Aztec Siltstone (Taylor Group, Beacon Supergroup) have been discovered near Mt. Hughes in the Cook Mountains, southern Victoria Land, more than 100 km south of the nearest previously known exposures. The newly found Aztec Siltstone rests conformably on Hatherton Sandstone, and has been dated as early Late Devonian (Frasnian) on the presence of phyllolepid placoderm fish. (Auth.)

E-43658

Grunow, A.M., **Aspects of the evolution of the West Antarctic margin of Gondwanaland**, New York, Columbia University, 1989, 129p., University Microfilms order No.89-19151, Ph.D. thesis. Refs. p.69-74.

West Antarctica is composed of 4 crustal blocks whose relationship to East Antarctica and to each other throughout the Phanerozoic is not well known. These blocks are: the Ellsworth-Whitmore Mountains (EWM); the Antarctic Peninsula (AP); Thurston I. (TI); and Marie Byrd Land (MBL). Paleomagnetic sampling and analysis were conducted on rocks from the EWM and TI blocks in the hope of constraining the motion of these blocks and the opening history of the Weddell Sea. The paleomagnetic results suggest that the AP, EWM and TI blocks have moved relative to East Antarctica prior to the mid-Cretaceous, and that the main opening of the Weddell Sea was between the Early and mid-Cretaceous. Detailed field mapping was conducted on the subduction complexes of the Scotia Metamorphic Complex (SMC) on Smith I. and Elephant I. Smith I. consists entirely of blueschist tectonites. Elephant I. rocks consist of greenschist, blueschist and albite-epidote amphibolite facies schists. Polyphase ductile deformation characterizes the Smith and Elephant Islands tectonites. Microprobe analyses indicate that the blue amphiboles from both areas are primarily crossite. Geochronology indicates a complex thermal evolution for the SMC. Uplift of the Smith I. blueschists occurred since 47 Ma while most of the uplift on Elephant I. occurred since 102 Ma. (Auth. mod.)

E-43671

Björck, S., Håkansson, H., Zale, R., Karlen, W., Jönsson, B.L., **Late Holocene lake sediment sequence from Livingston Island, South Shetland Islands, with palaeoclimatic implications**, *Antarctic science*, Mar. 1991 3(1), p.61-72, Refs. p.71-72.

Analysis of a 1.5 m thick sediment sequence from Midge Lake, Byers Peninsula, Livingston I., shows that the lake and its catchment have undergone significant changes during the last 4000 years. Radiocarbon dating (AMS), sediment lithology, and microfossil analyses indicate that the lake was deglaciated over 4000 C-14 years ago. Distinct peaks in accumulation rates of sediment, *Pediastrum* algae, pollen and spores, as well as changes in the diatom assemblage, suggest significant environmental changes between ca 3200 and 2700 y BP. These changes are interpreted as reflecting a milder and more humid maritime climate. The increased humidity can explain independent observations of glacier growth during this period. The combined data also indicate that between ca 1500 and 500 y BP the area might have experienced more continental conditions with slightly colder and drier climate than today. Since the C-14 dates from the Midge Lake sediments are regarded as reliable, and the sediment sequence is rich in tephra layers, this sediment sequence will be critical for a forthcoming tephra chronology of the region. (Auth.)

E-43672

De Mora, S.J., Whitehead, R.F., Gregory, M., **Aqueous geochemistry of major constituents in the Alph River and tributaries in Walcott Bay, Victoria Land, Antarctica**, *Antarctic science*, Mar. 1991 3(1), p.73-86, Refs. p.85-86.

Two geochemical surveys of the major constituents of the Alph River, Walcott Bay, were undertaken in summer of 1987-88. Tributaries and the runoff from various glaciers were also investigated. The Alph River has an average total dissolved solids (TDS) concentration of 63.5 mg/l, approximately half that of average world river water. The chemical composition is dominated by Na⁺ and HCO₃⁻.

Glacial melt waters have very low TDS but chemical weathering over the course of a few kilometers causes solute concentrations in the tributaries to exceed those of the Alph River. The composition of the streams is variable, but often Ca²⁺ is the principal cation. Enrich-

ment factor and mass balance calculations indicate that the salts in the Alph River and its tributaries have a substantial non-marine component. Chemical weathering of calcite, mirabilite, gypsum and halite contribute solutes to the aquatic system. A "Gibbs Plot" indicates that water samples from direct glacial runoff fall outside the world water envelope. They have low solute levels but enhanced Ca²⁺ concentrations, resulting from the aeolian deposition and subsequent dissolution of calcitic material. (Auth.)

E-43673

Eastman, J.T., Grande, L., **Late Eocene gadiform (Teleostei) skull from Seymour Island, Antarctic Peninsula**, *Antarctic science*, Mar. 1991 3(1), p.87-95, Refs. p.94-95.

On the basis of a skull from the late Eocene La Meseta Formation on Seymour I. a gadiform fish is reported from the antarctic region for the first time. This specimen, the most completely preserved fossil teleost cranium yet described from Antarctica, provides convincing evidence for the presence of Gadiformes in a far southerly location under temperate climatic conditions 40 m.y. ago. The exoccipital condyles, supraoccipital and lambdoidal crests, and post-temporal and supratemporal fossae are well preserved, as are the roofing bones on the posterior half of the skull. Comparative osteological study indicates that these features are very similar in appearance to those of merlucciids (hakes) and gadids (cods). (Auth.)

E-43674

Kelly, S.R.A., Doyle, P., **Bivalve *Aulacomyella* from the Early Tithonian (Late Jurassic) of Antarctica**, *Antarctic science*, Mar. 1991 3(1), p.97-107, Refs. p.106-107.

The bivalve *Aulacomyella* is described formally from Tithonian deposits of the Antarctic Peninsula region for the first time. Two species are recognized. *A. willeyi* Kelly sp. nov. was collected *in situ* from the Nordenskjöld Formation, Longing Gap on the east coast of Graham Land, and in clasts reworked into Cretaceous glide block deposits on James Ross I. *A. cf. problematica* Furlani is recorded from the Himalia Ridge Formation, Fossil Bluff Group, Alexander I. These antarctic records are the first published systematic descriptions of the genus from the Southern Hemisphere. Together with Mexican and Turkish records, they represent the last known occurrences of this genus. Globally the genus is particularly abundant during the Kimmeridgian and Early Tithonian stages and is therefore of value as a biostratigraphic indicator. It was almost certainly an epibyssate suspension feeder, although the precise palaeoecological setting for *Aulacomyella* is uncertain. (Auth. mod.)

E-43679

Zheng, X., Liu, X., **Geology of Fildes Peninsula, King George Island, West Antarctica: a study on the stratigraphy and volcanism**, *Antarctic research*, Dec. 1990 1(1), p.8-19, 25 refs.

On the basis of the geological mapping, isotopic chronological and petrological evidence, it is suggested that the Early Tertiary volcanic strata on Fildes Peninsula could be divided into 2 formations and 4 members. The erupted centers in the Peninsula were gradually migrating from the western to the eastern coast and the subvolcanic intrusives were regularly distributed along a series of NWW-SEE trending faults. All of these were basically formed in 2 stages of volcanic activities from Paleocene to Eocene. (Auth.)

E-43681

Wang, X., Zhao, Y., **Mathematical statistics of heavy minerals and their REE and trace elements in the northwestern sea area of Antarctic Peninsula**, *Antarctic research*, Dec. 1990 1(1), p.27-35, 6 refs.

Q-mode factor analysis of heavy minerals provides a 3-factor model of the heavy mineral assemblages in the submarine sediments

northwest of the Antarctic Peninsula. The common factor P1, composed mainly of pyroxene and metal minerals, and common factor P2, composed of hornblende, epidote and accessory minerals, represent 2 heavy mineral assemblages which are different in both lithological characters and origin of materials. The common factor P3 probably results from mixing of two end members of the 2 assemblages. R-mode group analysis of heavy minerals indicates that there are 2 heavy mineral groups in the area studied, which are different from each other in both genesis and origin of materials. With the help of R-mode analysis, 22 elements are divided into 3 groups and 9 subgroups. These element assemblages show that they are genetically related, and that they are different in geochemical behaviors during diagenesis and the mineral-forming process. The relationship between the heavy mineral assemblages and the element subgroups is discussed. (Auth.)

E-43684

Yang, S., Zhang, W., Shen, X., **Ground temperature and rock thermophysical properties in Fildes Peninsula, Antarctic research**, Dec. 1990 1(1), p.58-66, 4 refs.

During the austral summers of 1985 through 1987, and 1988-1989, a total of 218 ground temperature measurements were carried out on Fildes Peninsula. Thermal conductivity measurements were made also in 121 rock samples, and the description, and a sketch, are given of the minute digital temperature measuring device used. Data obtained are analyzed and shown in tables. Preliminary results concerning the geo-temperature and the thermophysical properties of specific localities on the Peninsula are discussed.

E-43698

Lawver, L.A., Della Vedova, B., Von Herzen, R.P., **Heat flow in Jane Basin, northwest Weddell Sea, Journal of geophysical research**, Feb. 10, 1991 96(B2), p.2019-2038, 32 refs.

Thirty-five heat flow measurements made in the Jane Basin, northwestern Weddell Sea, ranged in value from 67.5 to 92.1 mW/sq m. Twenty-eight values range between 75.0 and 84.6 mW/sq m. Magnetostratigraphy on the recovered core from Ocean Drilling Program hole 697, which was drilled in Jane Basin to a depth of 322 m, allowed sedimentation rates to be calculated back to 4.5 Ma. It is calculated that the measured heat flow is only 86-89% of the actual heat flow as a result of sedimentation. Heat generation in the sediments contributes 1.5-1.9 mW/sq m to the total heat flow. The corrected heat flow gives an age for the Jane Basin of between 25 and 32 Ma from age-versus-heat flow comparisons, similar to the age determined from basement depth. The Scotia Sea has been dated as anomaly 10 (30 Ma) and younger. The calculated age for the Jane Basin would indicate that it may have been created prior to the initiation of seafloor spreading in the Scotia Sea. Evidence from major plate motions indicate that Antarctica began to rotate clockwise away from South America at about 65 Ma. Such motion may have triggered subduction along the southeast side of Jane Bank and the opening of Jane Basin as a back arc basin. Subduction at Jane Bank ended at anomaly 6A time (22 Ma) as evidenced by the age of the identified magnetic anomalies on the antarctic plate found immediately to the east of Jane Bank. It is concluded that Jane Basin opened prior to the opening of the Scotia Sea, and that the spreading center that opened Jane Basin may have jumped to the Scotia Sea and produced the seafloor spreading there. (Auth. mod.)

E-43699

Zhao, J., **Modern environmental geochemical characteristics in the Great Wall Station region, Antarctic research**, 1990 2(2), p.1-12, In Chinese with English summary. 12 refs.

A study of the geochemical characteristics of the modern environment at the Great Wall Station is reported, with the object of determining the different chemical compositions and internal relationships among various elements in the epigenetic environment, as well as the

influence of anthropogenic activity on it. A comparison of the products of epigenetic and endogenic action shows marked regional characteristics in the former. The environmental geochemical characteristics of this region, when compared with other regions, reveal similarities as well as peculiarities. The element content of pedogenic mother rocks shows marked constraint on primitive soil. The constitution of the chemical elements of pyrogenic and sedimentary rocks is similar. The elements As in the former rocks, and Cu in the latter, are correlated to certain sulpho-philic elements in the primitive soil on them. The chemical constitution and content level of atmospheric precipitation in the region show marked instability; the chemical constitution and content level of surface water, however, are relatively stable. Atmospheric aerosols seem to be clearly of the oceanic type: more than 80% are derived from the ocean; roughly 10% are developed from the local soil; and another 10% come through long distance transmission. A marked increase of Pb and Cd contents is noted in the soil around the Station, which is attributed to the human factor. (Auth. mod.)

E-43702

Liu, Q., Jiang, T., **Algae fossils in sediments of West Lake on Fildes Peninsula of King George Island, Antarctica, and the environmental evolution, Antarctic research**, 1990 2(2), p.28-35, In Chinese with English summary. 26 refs.

A large amount of *Pediastrum* and *Bacillariophyta* fossils were found in sediments of the West Lake on Fildes Peninsula. A list of species included is presented. Based on the distribution and content variations of the fossils along the sedimentary profile, the following conclusions are made: about 3600 a. B.P., the area was covered with glaciers, because no algae fossils were discovered in this section at about 264-289 cm depth; from 3600 to 300 a. B.P. it was dominated by a shallow periglacial lake (a few *Pediastrum* fossils were found at depths from 289-224 cm); and from 3000 to 1200 a. B.P., the lake became deeper gradually as the climatic conditions improved. A large amount of *Pediastrum* and *Bacillariophyta* fossils were found from 224-87 cm; these algae lived in fresh water. At present (from 87 cm depth to the surface layer) the content of the fossils varies, showing that the lake level has fluctuated slightly. (Auth. mod.)

E-43709

Flöttmann, T., Kleinschmidt, G., **Opposite thrust systems in northern Victoria Land, Antarctica: imprints of Gondwana's Paleozoic accretion, Geology**, Jan. 1991 19(1), p.45-47, 24 refs.

Two major thrust systems with contrasting senses of displacement transect the Wilson terrane crust of northern Victoria Land. Along both mylonitic shear zones the central high-grade metamorphic basement is detached and thrust divergently toward the west and east over synorogenic, lower grade fore-arc and back-arc basin sedimentary rocks, respectively. Deformation was preceded by pervasive high-temperature-low-pressure metamorphism. Granites intruded the basement prekinematically and postkinematically. The structures are interpreted as results of early Paleozoic subduction of the paleo-Pacific ocean crust under the antarctic craton. (Auth.)

E-43725

Rotstein, Y., Munschy, M., Schlich, R., Hill, P.J., **Structure and early history of the Labuan Basin, South Indian Ocean, Journal of geophysical research**, Mar. 10, 1991 96(B3), p.3887-3904, 27 refs.

Recent multichannel seismic reflection data from the Labuan Basin, in the Southern Indian Ocean, are used to reevaluate older, single channel data from this region. Together, they throw light on the structure and evolution of this basin, situated between the older than 100 Ma Southern Kerguelen Plateau and the younger than 43 Ma Australian-Antarctic Basin. The Labuan Basin is a deep, extensive

basement depression, more than 350,000 sq km in area, located adjacent to the eastern margin of the Southern Kerguelen Plateau. The basement surface of most of the Labuan Basin is presently quite rough, as the result of a tectonic event which created prominent tilted block structures and turned it into a large northwest-southeast trending syncline. There is a 1-1.5 km elevation difference between the Labuan Basin and the Australian-Antarctic Basin created at the Southeast Indian Ridge, as well as a large difference in sedimentary thickness between them, indicating that the Labuan Basin is significantly older. The boundary of the Labuan Basin with the Kerguelen Plateau is generally a steep and somewhat linear feature which appears to be of tectonic origin: it seems to result from two extensive tectonic episodes, dated at 96 Ma and 75-68 Ma, associated with the prerift phase of plate breakup between Australia and Antarctica. An extensive tectonic episode, to the south of the Labuan Basin, initiated the formation of the boundary between the Southern Kerguelen Plateau and the Labuan Basin, an episode which could be linked to the beginning of seafloor spreading between Australia and Antarctica 96 Ma ago. Sediments were regularly deposited in the basin until 75-68 Ma, at which time an important extensional tectonic event occurred involving two large northwest-southeast uplifts; one, centered on the Kerguelen Plateau, affected the western part of the Labuan Basin, while the other, of which only the western half is observed, affected the eastern part of the Labuan Basin. This tectonic episode seems to correspond to the prerifting episode leading to the breakup between the Kerguelen Plateau-Labuan Basin and Broken Ridge-Diamantina Zone at 43 Ma. (Auth. mod.)

E-43727

Hall, K., **Mechanical weathering rates on Signy Island, maritime Antarctic, Permafrost and periglacial processes**, Jan.-Mar. 1990 1(1), p.61-67, With French summary. 18 refs.

By re-evaluating properties of rock tablets left in the field for varying time periods, an estimation of rock breakdown rates is attained. From data obtained during the last five years, it would appear that weathering rates are very slow, with only of the order of 2% mass loss per 100 years. These rates refer to omnidirectionally frozen, relatively wet samples and, on the basis of laboratory simulation results, are over 50 times greater than for unidirectionally frozen bedrock. It is suggested that mechanical weathering rates in the maritime Antarctic are very slow. (Auth. mod.)

E-43728

Margolis, S.V., Claeys, P., Kyte, F.T., **Microtektites, microkrystites, and spinels from a late Pliocene asteroid impact in the southern ocean**, *Science*, Mar. 29, 1991 251(5001), p.1594-1597, 15 refs.

The properties of glassy spherules found in sedimentary deposits of a late Pliocene asteroid impact into the southeast Pacific are similar to those of both microtektites and microkrystites. These spherules probably formed from molten silicate droplets that condensed from an impact-generated vapor cloud. The spherules contain inclusions of magnesioferrite spinels similar to those in spherules found at the Cretaceous-Tertiary boundary, indicating that both sets of spherules are impact debris formed under similar physical and chemical conditions. The objects reported here are a new type of fragment associated with the Eltanin meteorite which fell in subantarctic waters 1400 km due west of Cape Horn about 2.3 mya. (Auth. mod.)

E-43729

Myrcha, A., Tatur, A., Del Valle, R., **New species of fossil penguin from Seymour Island, West Antarctica**, *Alcheringa*, 1990 14(3-4), p.195-205, 31 refs.

A new species of Early Tertiary fossil penguin from Seymour I. is described on the basis of tarsometatarsi from the collection acquired during the Argentinian-Polish field party of 1985. *Palaeudyptes klekowskii* sp. nov. is bigger than earlier described species

of this genus from the same locality. Information is given on the new collection of fossil penguin bones, a large part of which was found in one horizon of Unit III of the La Meseta Formation. The collection also includes much of the accompanying invertebrate and vertebrate fauna. (Auth.)

E-43748

Liu, G., Cui, Z., **Coastal phenomena around Fildes Peninsula of King George Island, South Shetland Islands, Antarctica**, *Antarctic research*, 1990 2(3), p.18-26, In Chinese with English summary. 17 refs.

Investigations around Fildes Peninsula revealed 3 kinds of modern coastal features: fragmental coast, rock coast, and ice cliff coast. The fragmental coast shows some peculiar high latitude landforms formed by wave action with floating ice: linear gravel ridges near back-shore terrace, vertical gravel channels and ridges, pavements, gravel pits and network structure in tideland. Typical features appear in tideland, with gravel of 15-20 cm diameter and slopes below 5 deg. Wave action is an important process in the ablation of the ice cliff coast, and can accelerate the collapse of the ice cliff. The raised coastal features belong to two groups: the younger group is located below 20 m a.s.l. and was formed in the Holocene; the elevation of the older group is approximately 20 m a.s.l. and was formed during the last interglaciation. The raising rate of Fildes Peninsula is 10.0 mm/a, which is greater than that of the continental margin. (Auth. mod.)

E-43749

Ma, K., Wang, X., Li, Z., Zhao, Y., **Study on clastic minerals of surface sediments in the sea area northwest of the Antarctic Peninsula**, *Antarctic research*, 1990 2(3), p.27-38, In Chinese with English summary. 4 refs.

Clastic minerals of surface sediments recovered from 23 stations in the sea area northwest of the Antarctic Peninsula were analysed to determine the composition and distribution pattern of the minerals and their sources. The focus is on clastic minerals of 0.063-0.125 mm size fraction. The average content of heavy minerals in the sediments is 7.3%. The minerals are mainly clinopyroxene, orthopyroxene, hornblende, epidote, magnetite, ilmenite, pyrite, muscovite, biotite, chlorite, olivine, oxyhornblende, garnet zircon, apatite, rutile, volcanic glass, plagioclase, and quartz. They are divided into 3 mineral associations, according to their distribution pattern: pyroxene-volcanic glass, pyroxene-epidote-hornblende, and pyroxene-epidote-garnet associations. They are found in 2 zones: around the South Shetland Is., with basic volcanic clastic and metamorphic minerals, and west of the Antarctic Peninsula, with mid-acidic pyroclastic minerals. Sedimentation environments are briefly discussed. (Auth. mod.)

E-43750

Liu, Q., **Tertiary flora on Fildes Peninsula of King George Island, Antarctica and its environmental significance**, *Antarctic research*, 1990 2(3), p.39-45, In Chinese with English summary. 8 refs.

Some impressions of stems and leaves were found in the layers embedded in the grey-purple volcanic debris on Fossil Hill, 1.5 km northwest of the Great Wall Station on Fildes Peninsula. Analysis identified the fossils *Banksia* cf. *oblongifolia* Cav., *Sterculia* sp., *Paliurus* sp., cf. *Araucaria* sp., *Cupressites* sp. etc. From the stratigraphic correlation of the layers containing the impressions, and study of the characteristics of the fossils, it is believed that the plants lived in Late Eocene and Early and Middle Oligocene. Descriptions and sketches of plants identified are included. (Auth. mod.)

E-43781

Bettoli, M.G., Tositti, L., Tubertini, O., Cantelli, L., **Preliminary survey of the analysis of natural and artificial radionuclides in samples collected in Ross Bay, Antarctica**, *Annali di chimica*, 1989 79(11-12), p.735-739, 11 refs.

Preliminary data regarding the environmental impact of thirty years of nuclear experiments in Antarctica, obtained from samples collected by the Italian expedition in 1987-88, are reported. (Auth.)

E-43784

Duphorn, K., **Last glaciation of the Pacific shelf off north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.31-39, With German and Russian summaries. 21 refs.

The ice-sculptured topography of the Pacific shelf off north Victoria Land and the different suites of perched erratics on the Lyall Is. demonstrate the former existence of an ice sheet extending to the edge of the continental shelf. Most of the erratics derive from the adjacent mainland and from the sea floor of Yule Bay. The presence of olivine basalt erratics suggests that an outlet glacier from the Ross Sea ice sheet traversed the basalts of Adare Peninsula before flowing onto the Pacific shelf. The ice sheet which left the erratics probably corresponds to the last global glacial period which culminated 18,000 years BP and led to a lowering of the sea level of about 100 m. This event could have grounded a floating ice shelf and initiated the growth of large ice sheets on antarctic shelves. (Auth.)

E-43786

Jordan, H., **Geology of the northern Bowers Mountains, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.57-81, With German and Russian summaries. 24 refs.

Previously unvisited areas of Mt. Belolikhov, Mt. Bruce and Mt. Hager have been mapped. The Bowers Structural Zone consists of Glasgow Volcanics, varying in composition from basaltic to andesitic and dacitic, and by Molar Formation graywackes and minor slates. The volcanics and sediments are low-grade metamorphic. East of and adjacent to the Leap Year Fault, a chlorite-zone schist belt forms the northern continuation of the Millen Schists. The parent rocks, graywackes, minor slates, and volcanics do not differ petrographically from the Bowers Supergroup rocks. A syngenetic origin of the main cleavage of the Bowers Supergroup, of the shearing along the Leap Year Fault and of the Millen Schists foliation is discussed. These structural elements show compressional features and could be a late manifestation of the early Paleozoic subduction zone which generated the Glasgow Volcanics. (Auth.)

E-43787

Mortimer, G., Schmidt-Thomé, M., Tessensohn, F., **Stratigraphic problems in the upper part of the Bowers Supergroup, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.83-103, With German and Russian summaries. 25 refs.

The stratigraphic sequences of the Mariner and Leap Year Groups, the two upper units of Supergroup, are reviewed on the basis of new observations made in two separate areas within the Bowers Structural Zone, on Reilly Ridge in the central part of the region and on the flanks of the lower Mariner Glacier on the Ross Sea coast. The two areas are about 200 km apart. In the area of Reilly Ridge the stratigraphy of the Mariner and Leap Year sequences requires revision in height of recently found Tremadocian fossils. For the

lower Mariner Glacier area, new field observations are presented mainly on the Leap Year Group, which in the large synclinal structure of Spatulate and Gauntlet Ridges in most places directly overlies the Molar Formation, as the intermediate Mariner Group is largely missing. In this area the Leap Year succession can be divided into three units: a white-colored upper unit of pure quartzites, a middle "rose-colored" unit consisting of beige to white quartzites with numerous, often rose-colored, quartz-pebble horizons and a basal, brown, impure conglomeratic unit. (Auth.)

E-43788

Wright, T.O., Findlay, R.H., **Relationships between the Robertson Bay Group and the Bowers Supergroup—new progress and complications from the Victory Mountains, north Victoria Land**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.105-116, With German and Russian summaries. 20 refs.

The Robertson Bay Group and the Bowers Supergroup have been interpreted as being either autochthonous with respect to each other or having origins as widely separated "suspect" terrains. Prior to GANOVEX III it was thought that the Leap Year Fault separated Bowers Supergroup rocks west of the fault from the Robertson Bay Group rocks to the east. A polydeformed schist occurs on the east side of the fault along much of its length. During GANOVEX III, a sequence of marine shale, sandstone, and terrestrial conglomerate was found at Handler Ridge, east of both the Leap Year Fault and the belt of schist in the Millen Range. Limestone blocks of shallow water aspect from within the shale and sandstone of this sequence yielded fossils of uppermost Cambrian-lowermost Ordovician age. The lithology of this sequence resembles part of the Bowers Supergroup and appears to grade eastward into typical Robertson Bay Group rocks. Unfossiliferous equivalents of this sequence appear to be present to the north (Victory Mountains) and possibly 20 km to the south. These relationships are interpreted to suggest, but not prove, that the sequence at Handler Ridge is equivalent to the Bowers Supergroup. (Auth. mod.)

E-43789

Gibson, G.M., **Deformed conglomerates in the eastern Lanterman Range, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.117-141, With German and Russian summaries. 11 refs.

Two conglomerate units have been mapped in the eastern Lanterman Range. They have different compositions and different source areas, and neither belongs to the Precambrian Wilson Group. Psammitic Lanterman Conglomerate was derived from a metamorphic source area and everywhere separates Husky Conglomerate from the crystalline basement (Lanterman Metamorphics). Husky Conglomerate contains clasts of predominantly mafic materials metamorphosed to the greenschist facies, and was derived from a basic volcanic or metavolcanic source area, possibly the Glasgow Volcanics. Contacts between the two conglomerate units are faulted, but Husky Conglomerate contains blocks of possible Lanterman Conglomerate. An unconformable relationship is inferred although it is uncertain whether deformation post-dates the unconformity or whether the Lanterman Conglomerate was already deformed before the Husky Conglomerate was deposited. Contacts between Husky Conglomerate and Sledgers Group are similarly faulted with the former (greenschist facies) thrust eastward over very much lower grade Molar Formation. A Late Cambrian to Ordovician age is inferred for Husky Conglomerate. (Auth.)

E-43790

Findlay, R.H., Jordan, H., **Volcanic rocks of Mt. Black Prince and Lawrence Peaks, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.143-151, With German and Russian summaries. 8 refs.

Andesitic, basaltic and rhyodacitic/dacitic volcanics on Mt. Black Prince are intruded by rhyodacite and interbedded with Givetian to mid-Carboniferous sub-aqueous sediments containing *Protolpidodendropsis pultor* syn. *Bergeria minensis*; they overlie deformed Robertson Bay Group sediments and Devonian Admiralty Granite unconformably. The erosional relief prior to eruption was at least 1800 m. The volcanics are penecontemporaneous with the Gallipoli Rhyolite in north Victoria Land, through Tasmania, into south-eastern Australia. Rhyolitic volcanics occur at Lawrence Peaks, where they unconformably overlie Mariner and Leap Year metasediments and Devonian Admiralty granite. They may correlate with the rhyodacitic rocks of Mt. Black Prince. (Auth.)

E-43791

Crawford, A., Green, D.H., Findlay, R.H., **Preliminary petrographical-geochemical survey of dyke rocks from north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.153-165, With German and Russian summaries. 17 refs.

Thirty dykes, intruding the Lower Palaeozoic sequences of north Victoria Land, have been examined petrographically and analyzed for major elements. Transitional to alkaline basalts and trachybasalts, and evolved peralkaline trachyte-rhyolite dykes are correlated with Cenozoic lavas of the Ross Sea petrological province, which extends for 2000 km along the eastern margin of the Transantarctic Mountains. Subalkaline, low-Ca-pyroxene-bearing basalt dykes are identical to Jurassic Ferrar dolerite, which outcrops extensively in north Victoria Land and throughout the Transantarctic Mountains. Orogenic basalts, andesites and dacite dykes, many with high-K₂O affinities, could be associated with the Upper Devonian magmatic episode which produced the Black Prince Volcanic Complex and Gallipoli Rhyolite, which are basalt-andesite-dacite-rhyolite complexes exposed in north Victoria Land. The only group of dykes of uncertain affinities are some high-Mg, low-Ti andesites which intrude late Middle Cambrian Mariner Group metasediments. (Auth.)

E-43792

Engel, S., **Petrogenesis of contact schists in the Morozumi Range, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.167-185, With German and Russian summaries. 25 refs.

Granite-sediment contacts in the Morozumi Range were visited and examined along selected traverses. The Morozumi adamellite is estimated to have been intruded at a depth of 8 km. The contact temperatures reached 600 C. The contact schists along Graduation Ridge and El Pulgar and the hornfelses of the southern Morozumi Range were derived from Robertson Bay Group sediments. The different appearance of rocks close to the contact is mostly related to the different types of intrusion. (Auth.)

E-43793

Schubert, W., Olesch, M., Schmidt, K., **Paragneiss-orthogneiss relationships in the Kavrayskiy Hills, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.187-211, With German and Russian summaries. 43 refs.

The crystalline basement of the Kavrayskiy Hills was first investigated by GANOVEX II. The area is built up predominantly of metasedimentary rocks, together with concordant intercalations syn- to late-kinematic granodiorite and quartz diorite intrusions, which contain xenoliths and rafts of the country rock. Orthogneiss is restricted to the northern part of the area. Unfortunately, its actual contact with the paragneiss series is hidden by ice at the present time. Ortho-amphibolites also occur which, to a minor extent, represent former basic sills and dikes. Calc-silicates are apparently absent. In the Kavrayskiy Hills area, no indication of in-situ anatexis melting was found. The occurrence of garnet, sillimanite and of the index mineral cordierite is restricted to rocks of suitable bulk composition within the original sedimentary sequence. 18 mineral electron-microprobe analyses are presented; they comprise coexisting garnet, biotite, muscovite, and cordierite. The 21 rock analyses of metasedimentary material indicate a pelitic, psammitic, and graywacke parentage of the biotite-plagioclase gneiss, muscovite-free paragneiss and coarse-grained recrystallized gneiss, respectively. Estimates of the pressure and temperature of the main metamorphic event give 4.5 to 5 kbar H₂O and 600 to 650 C. These estimates were based on the ubiquitous presence of muscovite plus quartz, the lack of anatexis melting phenomena, the chemical composition of analyzed garnet and cordierite, as well as on the equilibrium curves of various minerals. (Auth. mod.)

E-43794

Kleinschmidt, G., Roland, N.W., Schubert, W., **Metamorphic basement complex in the Mountaineer Range, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.213-251, With German and Russian summaries. 36 refs.

West of the reverse fault which bounds the Bowers Supergroup and the greenschist facies metabasites, the Dessent Formation, which is very variable lithologically, crops out. The parent rocks of the Dessent Formation were altered mainly to muscovite quartzites, silicate marbles, garnet amphibolites, and mica schists typically containing staurolite and kyanite. A maximum of three phases of deformation can be demonstrated, but they were not detected in all rocks. The monotonous series of the Murchison Formation, mainly biotite schist and gneiss, crops out west of the Dessent Formation. It most probably derived from pelites and graywackes of a flysch series. In contrast to the Dessent Formation, the beginning of anatexis (high-grade metamorphism) is indicated by migmatite textures and sillimanite-bearing gneiss. Up to four phases of deformation were recognized. The Dessent and Murchison Formations are collectively called Mountaineer Metamorphics. The two formations cannot be correlated clearly since the contact is not exposed anywhere. According to the tectonic data obtained for both formations and in analogy to the boundary to the Bowers Supergroup, the Murchison Formation is probably thrust onto the Dessent Formation. Thus, the structural pattern of the Mountaineer Range is comparable with that of the Lanterman Range. (Auth. mod.)

E-43795

Grew, E.S., Kleinschmidt, G., Schubert, W., **Contrasting metamorphic belts in north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.253-263, With German and Russian summaries. 45 refs.

Two metamorphic belts of contrasting pressure types are recognized in the amphibolite facies rocks of the basement complex in northern Victoria Land. The western belt, which is exposed west of the Rennick and Aviator Glaciers, is characterized by andalusite to sillimanite transition, cordierite-muscovite-quartz assemblages, and steep metamorphic gradients. The eastern belt, which is exposed in

the Lanterman, Salamander, and Mountaineer Ranges, is characterized by the kyanite to sillimanite transition, staurolite in pelitic as well as relics of staurolite in mafic and ultramafic rocks and presence of ultramafics, including spinel- and garnet-olivine pyroxenites. The contrasting belts have several features of Miyashiro's paired metamorphic belts, but characteristic minerals of the high-pressure type are lacking. The boundary between the two belts may provide a useful reference in fitting Australia, Tasmania and Antarctica in Gondwanaland reassemblies. (Auth.)

E-43796

Adams, C.J., Kreuzer, H., **Potassium-argon age studies of slates and phyllites from the Bowers and Robertson Bay terranes, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.265-288, With German and Russian summaries. 40 refs.

New potassium-argon total-rock age determinations of low-grade metasedimentary rocks, mainly slates and phyllites of late Precambrian to Ordovician ages of sedimentation, from the Bowers and Robertson Bay terranes of northern Victoria Land, fall predominantly into the age ranges of 275-505 Ma and 455-505 Ma, respectively. The age patterns are interpreted in terms of the three terranes of the Ross Fold-Belt of northern Victoria Land which are, from west to east, the Wilson, Bowers, and Robertson Bay terranes. The observations suggest that the three terranes had a common geological history during the Cambro-Ordovician Ross Orogeny, but subsequently, during the formation of the Bowers graben structure, at least in the deeper positions, the rocks within this structure were sufficiently buried and heated to lose some of their accumulated radiogenic argon. These rocks then remained at an elevated temperature until the final uplift and cooling of the graben sequence, presumably during the Mesozoic. The metamorphic history of the Cambro-Ordovician Ross Fold-Belt in northern Victoria Land appears to be similar to that to the south, in the central Antarctic Mountains, and similar to that in the probable northward extension into Tasmania. These age patterns are older than those of the low-grade metasediments of presumed eastward extensions into Marie Byrd Land, and into the South Island, New Zealand, which are probably also of late Precambrian to Cambrian ages of sedimentation. (Auth. mod.)

E-43797

Gibson, G.M., Tessensohn, F., Crawford, A., **Bowers Supergroup rocks west of the Mariner Glacier and possible greenschist facies equivalents**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.289-318, With German and Russian summaries. 19 refs.

The southern part of the Palaeozoic Bowers Structural Zone was mapped between Evans Névé and Ross Sea. In the area immediately west of the Mariner Glacier, sediments and volcanics of the Bowers Supergroup were studied and are described in the first part of the paper. Further west and in tectonic contact with the gneisses and schists of the Mountaineer Metamorphics there follows a narrow belt of low grade and multiply deformed metamorphic rocks. These greenschists and deformed conglomerates, which are still within the Bowers Structural Zone, are described in the second part. Structure and metamorphism of the different units are discussed in a third section. In a final discussion it is suggested that the greenschist rocks and deformed conglomerates have correlatives in the Bowers Supergroup. (Auth.)

E-43798

Roland, N.W., Gibson, G.M., Kleinschmidt, G., Schubert, W., **Metamorphism and structural relations of the Lanterman metamorphics, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.319-361, With German and Russian summary. 36 refs.

The Lanterman Range is surrounded on all sides by glaciers and faults so that only in the NE in the Reilly Ridge area can any relationship with the adjacent rock units be made out. In this area the Lanterman Metamorphics are thrust over graywackes and slates of the Bowers Supergroup. The core of the Lanterman Range is made up of biotite and hornblende-biotite gneisses and calc-silicates as well as a great variety of related metasediments. A stratigraphic sequence comprising quartz and feldspar rich to pelitic and marly rocks was recognized in the metasediments but it has not been possible so far to determine the younging direction of these rocks. Their main strike direction is NW-SE. The metamorphic grade appears to increase from east to west since migmatites and the accompanying granodiorites, tonalites, and associated dyke swarms are exposed towards the western margin of the Lanterman Range. In this area, thrusting has exposed a deeper level in the crust. In places, the granites on the western margin are thrust onto Permian Beacon Sandstone and Jurassic Ferrar Dolerites. The Lanterman Metamorphics originated under the following conditions: moderate temperatures and pressures based on the presence of relict kyanite and staurolite. The zonation of some of the garnets shows that the first phase of metamorphism was followed by a second of slightly lower P-T conditions and a final retrograde phase. (Auth. mod.)

E-43799

Vetter, U., Lenz, H., Kreuzer, H., Besang, C., **Pre-Ross granites at the Pacific margin of the Robertson Bay terrane, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.363-369, With German and Russian summaries. 9 refs.

There is evidence for at least two separate phases of Admiralty Intrusives from whole-rock and mineral dating: early Devonian, and at the Devonian-Carboniferous boundary. At the northern margin of the Robertson Bay terrane two petrographically very different granitoids were detected which are older than the early Ordovician Ross Orogeny: the Cooper Spur granite intrudes folded Robertson Bay Group metasediments. Therefore, its Rb-Sr whole-rock isochron age of 525 Ma postdates the first deformation of the metasediments. Similar ages are determined for the Wilson Terrane, e.g. 535 Ma for the "Terra Nova Granite". Muscovites from this intrusion give a Ross age of about 480 Ma, whereas the biotites have been reset to Admiralty ages of about 360 Ma. (Auth.)

E-43800

Tessensohn, F., **Geological and tectonic history of the Bowers structural zone, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.371-396, With German and Russian summaries. 63 refs.

The Bowers Structural Zone, a narrow, fault-bounded belt of rocks that stretches across northern Victoria Land, has so far been interpreted as a graben or sedimentary trough. A brief description is given of the Lower Paleozoic sediments and metasediments which make up this zone. The sedimentary features suggest deposition on a slope rather than in a trough. The neighboring areas consist of metamorphic rocks in the west and turbidite basin sediments in the east. The relationships between the rocks of the Bowers Structural

Zone and those of the adjacent areas across the boundary faults are discussed. During mapping of the boundary faults, it could be shown that the faults are truncated in several places by Late Devonian granites. Thus, for the first time, an upper age limit has been demonstrated for the formation of the Bowers Structural Zone. The boundaries of the Bowers Structural Zone are characterized by reverse and thrust faults and mylonites, which have locally been affected by greenschist facies metamorphism. The vergence of the thrusting is to the northeast, that is from the metamorphic rocks towards the turbidite basin. According to whole-rock age determinations on phyllites and from geological considerations, the thrusting represents a late phase of the Ross Orogeny. It can be shown from the facies of the sediments that, due to the thrusting, part of the succession between the major tectonic blocks is missing. This is explained by telescoping associated with the dragging of sediments into a westerly dipping subduction zone. (Auth. mod.)

E-43812

Naraoka, H., Shimoyama, A., Komiya, M., Yamamoto, H., Harada, K., **Hydrocarbons in the Yamato-791198 carbonaceous chondrite from Antarctica**, *Chemistry letters*, May, 1988 No.5, p.831-834, 9 refs.

DLC QD1.C744

Yamato-791198 yielded up to 44 aromatic hydrocarbons and related compounds in the range of naphthalene and pyrene, including almost all structural isomers of methyl- and dimethyl-naphthalene. Several predominant compounds were present at the level of 10 exp (-7) g/g. Normal alkanes (C12-C22) were predominant in the aliphatic hydrocarbons and were at the level of 10 exp (-8) g/g. (Auth.)

E-43814

Daniushevskaya, A.I., Smirnov, V.I., Petrova, V.I., Beliaeva, A.N., **Geochemistry of organic matter in bottom sediments of the Weddell Sea**, *Oceanology*, Dec. 1989 29(3), p.322-328, 11 refs. For Russian original see 18E-41739.

The distribution, makeup and genesis of organic matter in bottom sediments of the Weddell Sea are discussed. The geochemical background levels of bitumen, organic matter, and polynuclear aromatics (PNAs) in the sediments are determined. Deviations from the background level, probably caused by secondary processes, are found. Geochemically, the organic matter has characteristic properties resulting from the distinctive character of the hydrobiont organic matter from which it was formed. (Auth. mod.)

E-43821

Dallmann, W.K., Austrheim, H., Bucher-Nurminen, K., Ohta, Y., **Geology around the Norwegian antarctic station Troll, Jutulssessen, Dronning Maud Land**, *Norsk Polarinstitutt. Meddelelser*, 1990 No.111, 39p., 11 refs.

Quaternary deposits are particularly restricted to the inner parts of the Jutulssessen glacier cirques. Deposits are till and talus which locally are admixing at slope angles of c. 25 deg. Moraines are poorly developed. Patterned ground ('stone pits') are common at slope angles below c. 15 deg. Recently active phenomena of special interest are ice-margin meltwater lakes with pingo-like 'blisters', the deep frost-shattering all over the mountain walls and holes in rock surfaces as a result of wind activity with grinding particles. The bedrock belongs to the East Antarctic craton. The area under consideration (western Mühlig-Hofmannfjella and Gjelsvikfjella) consists of high-grade metamorphic rocks, and forms one of the world's best exposed granulite terranes. Orthogneisses and minor metasediments have been intruded by a series of charnockites, partly altered to granulites (the 'Svarthamaren charnockite complex'), and a sequence of dyke rocks. Both gneisses and granulites/charnockites show abundant evidence of transition from granulite to amphibolite facies and vice versa, and the important role of fluid-rock interactions leading to these processes can be studied. The gneisses at Jutulssessen show a com-

plex deformation history. They are thought to be derived from granitic intrusions, though minor amounts of high-grade metamorphic, metapelitic gneisses may represent their original host rocks. Early tectonism (c. 1000-1200 m.y.) produced gneissosity, compositional banding and a leucosome phase under high-grade metamorphic conditions. This was followed by multiple and complex intrusive activity, partial migmatization and a tectonic overprint with abundant shear deformation under amphibolite-facies conditions (c. 450-500 m.y.). (Auth. mod.)

E-43828

Goode, J.W., Borg, S.G., Smith, B.K., Bennett, V.C., **Tectonic significance of Proterozoic ductile shortening and translation along the antarctic margin of Gondwana**, *Earth and planetary science letters*, Jan. 1991 102(1), p.58-70, 55 refs.

The central Transantarctic Mountains are divided into distinct lithotectonic packages of variable age, deformation style and metamorphic character. In the Miller Range (83S, 155E), the boundary between two such lithotectonic units is a low-angle, thrust-type ductile shear zone that carried high-grade gneisses of the East Antarctic craton to the southeast over a lower-grade metasedimentary sequence. Broad constraints limit the age of ductile deformation as late Early Proterozoic to Late Cambrian. In addition to a reverse component of movement, this zone also records along-strike motions in a direction subparallel to the present orientation of dominant Beardmore- and Ross-age orogenic trends. It is postulated that major pre-Ordovician crustal shortening which occurred along this part of the Gondwana continental margin began in the Middle to Late Proterozoic as an early phase of long-lived convergence. Furthermore, orogen-parallel displacements indicate that oblique plate interactions may have played an important role in the early evolution of this active margin. (Auth.)

E-43829

Harris, C., Watters, B.R., Groenewald, P.B., **Geochemistry of the Mesozoic regional basic dykes of western Dronning Maud Land, Antarctica**, *Contributions to mineralogy and petrology*, Mar. 1991 107(1), p.100-111, 43 refs.

Regional dolerite dykes of Mesozoic age in western Dronning Maud Land are variable in both major and trace element composition and include picritic types (MgO > 18 wt%). The range in incompatible element concentrations is considerable (e.g. Zr 40-478 ppm) and shows little correlation with MgO content. Both high- and low-Ti, Zr (HTZ and LTZ) magma types are present and there is a spread of compositions between these types. Major element oxide variations in dykes having MgO > 10 wt% indicate that olivine and orthopyroxene fractionation occurred, presumably at an early high-pressure stage of magma evolution. Major element oxide variations in dykes having MgO < 10 wt% indicate control by olivine and clinopyroxene. A minority of the more evolved dykes are compositionally similar to the nearby Kirwan basalts, but the majority cannot be related to the Kirwan basalts by any simple petrogenetic process as they contain higher concentrations of incompatible elements and have higher Mg-numbers. The HTZ Dronning Maud Land dolerites have incompatible trace element concentrations which are very similar to the HTZ basalt magma types of the Karoo of southern Africa, with the exception of lower K and Rb in DML dolerites. The HTZ dolerites occur in the part of Dronning Maud Land which appears to have been tectonically stable since the Archaean and are not found to intrude the surrounding high-grade (about 1000 Ma) metamorphic rocks of the Sverdrup Group. These data provide qualified support for models which seek to relate spatially the HTZ Mesozoic basalt types of Gondwana to sources beneath stable Archaean cratons. (Auth.)

E-43840

Ohta, Y., Törudbakken, B.O., Shiraishi, K., **Geology of Gjelsvikfjella and western Mühlig-Hofmannfjella, Dronning Maud Land, East Antarctica**, *Polar research*, Dec. 1990 8(2), p.99-126, 32 refs.

As a part of the Norwegian Antarctic Research Expedition 1984/85, geological mapping was performed in Gjelsvikfjella and western Mühlig-Hofmannfjella, Queen Maud Land. The northern part of Gjelsvikfjella is dominated by the Jutulssessen metasupracrustals which have been intruded by a major gabbroic body and several generations of dykes. To the south, the metasupracrustals gradually transform into the Risemedet migmatites. In western Mühlig-Hofmannfjella the bedrock is dominated by the large Svarthamaren Charnockite batholith. The batholith is bordered by the Snötoa metamorphic complex outcropping to the south and west in Mühlig-Hofmannfjella and it is characterized by a high content of partly assimilated country rock inclusions. Mineral paragenesis and geothermometry/geobarometry suggest a two-stage tectonothermal-igneous history with an initial intermediate pressure, upper amphibolite to granulite facies metamorphism followed by high temperature transformations related to the charnockite intrusion. The age of the initial tectonothermal event is probably about 1,100 Ma. Geochronological work in the present study (Rb/Sr whole rock) gave an age of 500 Ma for the Svarthamaren Charnockite, interpreted to record the age of crystallization. Late brittle faulting and undeformed dolerite dykes outcropping in Jutulssessen are believed to be related to Mesozoic crustal stretching in the Jutulstraumen-Pencksökktet Rift Zone to the west. (Auth.)

E-43841

Ottesen, P.S., Meier, T., **Tardigrada from the Husvik area, South Georgia, subantarctic**, *Polar research*, Dec. 1990 8(2), p.291-294, 20 refs.

Eleven species of tardigrades in South Georgia, of which two are new to science, were found in samples collected at 15 localities. The highest number of species was found in moss from a scree field. Twenty species of tardigrades are presently known from South Georgia, but the island remains insufficiently investigated. The species composition is similar to that of southern South America. The high number of cosmopolitan species makes the geographical distribution pattern of the South Georgian tardigrades more similar to that of macrolichens than to that of insects and vascular plants. (Auth.)

E-43861

Mikhal'skiĭ, E.V., Laĭba, A.A., **Subalkaline basic dykes of Jetty Peninsula (East Antarctica)** [Daĭki osnovnykh porod subshchelochnogo riada v oazise Dzhetti (Vostochnaia Antarktida)], *Antarktika; doklady komissii*, 1990 No.29, p.56-66, In Russian with English summary. 13 refs.

A sublongitudinal mafic dyke swarm was studied at Jetty Peninsula (Beaver Lake area). The central part of the peninsula where the dykes are particularly numerous was mapped in detail. The dykes intersect basement rocks. The margins of the dykes usually exhibit kataclastic fabrics and secondary quartz veins. Three events of dyke emplacement are suggested. The oldest dykes consist of subalkaline dolerites and lamprophyres. The second and third generations are composed of ferrosyenodiorites and diorite-porphyrates, respectively. There are also rare dykes of camptovogesites and odinites. The rocks of the first dyke generations are similar in chemical composition, except for augite-camptonites rich in K₂O, Na₂O, TiO₂ and P₂O₅ components. The rocks of the second dyke generation are more variable in chemical composition. Difference in chemistry of the first and second dyke generations is evident and might have been due to fractionation of clinopyroxene and olivine in equal proportions. The chemistry of the rocks suggests the Bowen-type trend, characterized

by a steep increase in alkaline and silica components against the background of a slight increase in iron. Diorite-porphyrates can be compared to calc-alkaline basalts. All the rocks described are believed to be late Paleozoic in age. (Auth. mod.)

E-43865

Bardin, V.I., **Antarctic lakes as a source of paleoglacial information** [Ozera Antarktidy: paleogliatsiologicheskie aspekty izucheniia], *Antarktika; doklady komissii*, 1990 No.29, p.90-96, In Russian with English summary. 26 refs.

Studies of periglacial basins as a possible source of paleoglaciological information are discussed. As most water basins were formed as the result of the last stage of antarctic glacier retreat, the main task of paleoglaciology is to determine the exact date of these events. The author suggests that the lakes of Victoria Land, Queen Maud Land and Prince Charles Mts. are unique hotbeds of life existing close to glaciers. The study of the Amery oasis lakes provided information for the period of 20-90 thousand years; for the Dry Valleys of Victoria Land, for the period of 30-56 thousand years.

E-43866

Bardin, V.I., Piskun, A.A., Shmideberg, N.A., **Hydrological and hydrochemical characteristics of deep water basins in Prince Charles Mountains** [Gidrologo-gidrokhimicheskaia kharakteristika glubokovodnykh vodoemov v gorakh Prins-Charl'z], *Antarktika; doklady komissii*, 1990 No.29, p.97-112, In Russian with English summary. 12 refs.

Hydrological and hydrochemical peculiarities of continental and epishelf water basins of Prince Charles Mountains are discussed. Continental Radok Lake occupies a kettlehole of tectonic origin, the bottom of which is more than 350 m below sea level. Hydrochemical data on epishelf water basins, such as Beaver Lake among others, prove their hydraulic connection with the ocean. The difference between Radok Lake and epishelf water basin origins accounts for their difference in water, ice, temperature and hydrochemical conditions. The border of the continental water transformed into sea water of epishelf lakes is determined by the salinity rate (more than 25 per mill) and a Ca/Cl coefficient equal to 0.021. The midland Radok Lake is recharged exclusively by continental waters, and that is why values of mineralization are comparatively low (not more than 115 mg/l). (Auth. mod.)

E-43867

Vasil'ev, V.P., **Role of icebergs in terrigenous sedimentation in the world ocean** [O roli aĭsbergov v terrigenom osadkoobrazovanii Mirovogo okeana], *Antarktika; doklady komissii*, 1990 No.29, p.113-119, In Russian with English summary. 19 refs.

Terrigenous clastic material transportation from recent glacial areas to the world ocean is discussed. Results of ice shelf drilling showed the lack of clastic material in the bottom layers of the ice sheet flowing into the ocean, probably due to the peculiarities of the ice sheet dynamics and thermophysics. Bottom melting is caused by geothermal heat flow (in the central part of the ice sheet) and ice friction at the bed (in the peripheral parts). It was calculated that the thickness of the ice bottom layer, which annually melts in peripheral areas of the continent, is 7.5 m, i.e. the whole bottom moraine-bearing layer is melting. Clastic material released as the result of this melting is partly accumulated in the hollows of the sub-ice topography and is partly transported to the shelf as a sediment discharge of the subglacial melting streams. Thus the interice beds and lenses of the moraine located 5-10 m above the continental ice sheet basement are the main source of clastic material transported to the ocean sedimentation areas within icebergs. (Auth.)

E-43875

Sears, D.W.G., Benoit, P., Batchelor, J.D., **Evidence for differences in the thermal histories of antarctic and non-antarctic H chondrites with cosmic-ray exposure ages <20 Ma**, *Geochimica et cosmochimica acta*, Apr. 1991 55(4), p.1193-1197, 34 refs.

Antarctic H chondrites show a different range of induced thermoluminescence properties compared with those of H chondrites that have fallen elsewhere in the world. Recent noble gas data show that this difference is displayed most dramatically by meteorites with cosmic-ray exposure ages <20 Ma, and they confirm that the differences cannot be attributed to weathering or to the presence of a great many fragments of an unusual antarctic meteorite. Annealing experiments on an H5 chondrite, and other measurements on a variety of ordinary chondrites, have shown that induced TL properties are sensitive to the thermal histories of the meteorites. It is concluded that the event(s) that released the <20 Ma samples, which are predominantly those with exposure ages of 8 Ma, produced two groups with different thermal histories, one that came to Earth several 100,000 years ago and that are currently only found in Antarctica, and one that is currently falling on the Earth. (Auth.)

E-43879

Bartek, L.R., Vail, P.R., Anderson, J.B., Emmet, P.A., Wu, S., **Effect of Cenozoic ice sheet fluctuations in Antarctica on the stratigraphic signature of the Neogene**, *Journal of geophysical research*, Apr. 10, 1991 96(B4), p.6753-6778, Refs. p.6775-6778.

Stratigraphic successions from the Gulf of Mexico-offshore Alabama, northeast Java-Indonesia, Ross Sea-Antarctica, and several other continental margins have been examined. All are characterized by very similar Neogene stratal geometries. The interregional character of the Neogene stratal signature and its similarity to the stratal geometry found in seismic data from the Ross Sea continental shelf suggest that the Neogene stratal signature is a manifestation of glacioeustatic fluctuations. A review of the literature and an analysis of recently acquired and published data indicate that the first major ice sheet grounding event in the Ross Sea occurred during middle to late Oligocene time. The Ross Sea is the repository for ice flowing from a major portion of the continental interior. Thus the glacial record of the Ross Sea should serve as a gage of ice volume changes on the continent that were large enough to influence global eustasy. The ice advance onto the Ross Sea continental shelf during middle to late Oligocene time may have been the result of a decrease in the rate of shelf subsidence as rifting in the Ross Sea slowed or ceased. Advance of the ice sheet resulted in widespread erosion of the continental shelf and shelf overdeepening. It is hypothesized that metastable, marine-based ice sheets have waxed and waned on the antarctic continental shelf since at least the Oligocene and that these waxing and waning events were responsible for the development of a global Neogene stratigraphic signature. (Auth. mod.)

E-43893

Krasnikov, N.N., Mel'nik, A.IU., **Charnokitoids of the northern Prince Charles Mountains (East Antarctica)** [Charnokitoidy severnoï chasti gor Prins-Charl'z (Vostochnaia Antarktida)], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.10-16, In Russian. 8 refs.

Structural characteristics of the mineral and chemical composition of rocks studied show a close interrelationship between two charnockite groups of the northern area of Prince Charles Mountains and a group of recently folded autochthonous geomorphic-metasomatic charnockites. The petrology of each group is described and the genetic implications are discussed.

E-43894

Laiba, A.A., Traube, V.V., Aleksashin, N.D., Shuliatin, O.G., Peich, H.IU., **Reconnaissance geological investigations in eastern Queen Maud Land** [Rekognostsirovocnyye geologicheskie issledovaniia v zapadnoï chasti Zemli Korolevy Mod], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.16-24, In Russian. 12 refs.

Results of the study of, among others, the Borg Massif and the Ahlmann Ridge, are summarized as follows: the area investigated is divided in two large tectonic elements; a triple lithostratigraphic subdivision, from the bottom up, of the Ritscher Complex is proposed: terrigenous, volcanogenic-terrigenous, and terrigenous-volcanogenic; the Proterozoic history of the formation of the Borg Massif and the Ahlmann Ridge shows two main stages of geologic development: the terrigenous and the trappean formations; intrusions of felsic porphyries and porphyroblastic granodiorites in the area are, hypothetically, related to a Proterozoic and Late Proterozoic evolution, respectively; ages of 1,000 Ma and 1,700 Ma are determined for the Borg Massif intrusives.

E-43895

Butsenko, V.V., Kudriavtsev, G.A., **Application of the CSC-3 data processing system for deciphering multichannel seismic records obtained under antarctic continental shelves** [Opyt primeneniia sistemy obrabotki dannykh STSS-3 dlia rasshifrovki mnogokanal'nykh seismicheskikh zapisei, poluchennykh v usloviakh shel'fa antarkticheskikh morei], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.24-35, In Russian. 7 refs.

Various methods used in the study of seismic exploration records are examined; some of the profiles studied are shown. Seismic sequences, structural elements, and types of waves obtained at the continental shelf of the Sodruzhestvo Sea are reviewed. The CSC-3 method, used in processing of data obtained during the 32nd Soviet Antarctic Expedition, is described and found useful in the simultaneous prognosis and reading of some disturbances of regular waves.

E-43904

Bol'shiiyanov, D.IU., **Main features of the geomorphological structure of Bunger Oasis (East Antarctica)** [Osnovnye cherty geomorfologicheskogo stroeniia oazisa Bangera (Vostochnaia Antarktida)], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.79-90, In Russian. 6 refs.

A glacio-morphological map of Bunger Hills is presented and reviewed, based on field data and the use of the first geocryological and geological maps of the area. The dimensions, topography and other peculiarities of the ice free area, numerous lakes, islands, and surrounding glaciers are discussed. The last massive ice cover withdrawal from the region is estimated to have taken place no later than Early Holocene.

E-43905

Vand, U., Kharmikhen, V.D., Klovov, V.D., Ufimtsev, A.V., **Results of isotope hydrochemical testing of Beaver and Radok Lakes** [Rezultaty izotopno-gidrokhimicheskogo aprobeirovaniia ozer Biver i Radok], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.90-95, In Russian. 6 refs.

Bathymetry, water mass structure and hydrological regime investigations carried out on two antarctic shelf-ice lakes, Beaver and Radok, in the summer of 1984-1985, show the following: Beaver Lake has a year round ice cover 3-6 m thick; maximum water depth of 400

m; occurrence of salinity at 220-250 m depth, at which point fresh water turns into sea water, indicating the oceanic origin of the lake's water masses. Radok Lake also has a year round ice cover about 2 m thick, maximum water depth of 362 m, and temperature of 0.0-0.2 C; its waters, however, are entirely salt-free.

E-43914

Osanai, Y., **Finding of vanadium-bearing garnet from the Sör Rondane Mountains, East Antarctica, *Antarctic record***, Nov. 1990 34(3), p.279-291, 10 refs.

Vanadium-bearing green garnets have been found in the Menipa mountain mass, central part of the Sör Rondane Mountains. These garnets are the main constituent minerals of granulite-facies metamorphosed graphite-bearing calcareous metapelite. They show 3 types of mode of occurrence: large porphyroblast (type-1), fine crystal (type-2) in kelyphite rim around type-1 garnet, and fine-grained porphyroblast (type-3) in matrix. These 3 types of vanadium-bearing garnets exhibit distinct characters in chemical compositions. Modes of occurrence and chemical characteristics of vanadium-bearing green garnets are described, and their physical properties are examined. (Auth. mod.)

E-43921

Yanai, K., **Activities of the wintering party at Asuka Station by the 29th Japanese Antarctic Research Expedition in 1988-1989, *Antarctic record***, Nov. 1990 34(3), p.394-429, In Japanese with English summary. 4 refs.

The winter activities of JARE-29, consisting of 10 members including 4 scientists, arriving at Asuka Station on Dec. 28, 1987, are reported. The main activities concerned a search for meteorites on the bare ice around the Sör Rondane Mountains. Other programs comprised meteorological surveys, studies of upper atmosphere physics, glaciological survey, medical-biological studies, and logistics. A systematic search for antarctic meteorites was carried out 5 times, between Jan. 1988 and Jan. 1989. More than 2000 meteorites, about 400 kg in weight, were collected from three main areas around the mountains. (Auth. mod.)

E-43946

Tessensohn, F., **Ross Sea area: a key to many geotectonic problems [Das Ross-Meer-Gebiet im Schnittpunkt geotektonischer Fragen]**, *Geologisches Jahrbuch, Reihe A*, No.75, Hanover, Germany, 1984, p.261-283, In German with English and Russian summaries. 46 refs.

New marine seismic data from the Ross Sea has provided evidence for the existence of three troughs several kilometers deep. These trend parallel to the fault zone on the western margin of the Ross Sea, which is not only associated with volcanic activity but is also a major tectonic feature. In North Victoria Land, the orogen consists of three distinct zones: a crystalline metamorphic area in the west, a narrow belt of volcanic and sedimentary rocks in the center and a turbidite area in the east. The three zones have suffered different grades of metamorphism but, according to radiometric ages, have all undergone contemporaneous deformation. The contacts between the zones are faulted. There is considerable contrast between the geology of this part of Antarctica and the corresponding continental margin of Australia. The Ganovex Expedition of 1982/83 made several discoveries which are relevant to the tectonic history of North Victoria Land: the time between the end of sedimentation and Ordovician deformation has now been considerably narrowed by the discovery of Ordovician fossils. Upper Devonian granite truncates the boundaries between all three zones and thus conveniently provides a minimum age for the deformation. Another significant discovery was made in the Lanterman Range: unusually strong deformation, folding and thrusting occurs in a very narrow zone and involves Permian cover rock, the Beacon Sandstone, which is otherwise found

practically undeformed throughout the Transantarctic Range. (Auth. mod.)

E-43955

Franzmann, P.D., Roberts, N.J., Mancuso, C.A., Burton, H.R., McMeekin, T.A., **Methane production in meromictic Ace Lake, Antarctica, *Hydrobiologia***, Mar. 8, 1991 210(3), p.191-201, Refs. p.199-201.

Methane occurred in the monimolimnion, at depths greater than 11 m, of an antarctic meromictic lake, Ace Lake (depth 24.7 m). Although the water of the lake was of approximate marine salinity, bottom waters were depleted in sulfate (less than 1 mmol/l). The temperature of the bottom waters of the lake were constantly between 1 C and 2 C. Reliable determinations of rates of methanogenesis at some depths using some precursors were obtained, the fastest rate being 2.5 micromol/kg/day at 20 m depth. Assuming constant rates of methanogenesis with time, this would equate to a turnover of methane in the lake every two years. The slow rate of methanogenesis suggests that the methanogens in Ace Lake may be working at well below their optimum temperature, although definitive statements regarding the presence of psychrophilic methanogens in this antarctic lake must await isolation attempts or longer field studies using alternative methodologies. (Auth. mod.)

E-43958

Vogt, S., Herzog, G.F., Reedy, R.C., **Cosmogenic nuclides in extraterrestrial materials, *Reviews of geophysics***, Aug. 1990 28(3), p.253-275, Refs. p.270-275.

The irradiation in space of meteoroids has been simulated by means of accelerator experiments both with very thick and with spherical targets, and various models for calculating production rates of cosmogenic nuclides have been developed or refined. New classes of material—meteorites recovered in Antarctica and tiny meteorites from the stratosphere and deep-sea sediments, for example—have become more widely available for analysis. Cosmogenic nuclides have been put to use in unfolding increasingly complex exposure histories. Some grains in gas-rich meteorites were irradiated in at least two episodes, and others perhaps even before the solar system formed. Continuing measurements of lunar samples reveal the past behavior of energetic solar particles. We now know from cosmogenic nuclide measurements that many meteorites found in Antarctica have been there for some 0.1-1 million years and that the age distributions vary from site to site. (Auth. mod.)

E-43963

Scasso, R.A., Del Valle, R.A., **New observations on the Ameghino Formation, Sobral Peninsula, Antarctica [Nuevas observaciones sobre la Formación Ameghino en la península Sobral, Antártida]**, *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.374, 43p., In Spanish with English, German and French summaries. 22 refs.

A sedimentary sequence belonging to the Ameghino Formation (Kimmeridgian-Berriasian) was studied on Sobral Peninsula, in the northeastern Antarctic Peninsula. The Ameghino Formation consists of alternating Radiolaria-rich mudstones and ash fall tuffs. On two nunataks, which are informally named El Manco and Tres Amigos, detailed lithologic, stratigraphic and paleoenvironmental studies of the sequence were carried out. On the El Manco Nunatak, the sequence is divided into three parts, according to thickness: lower (180 m), middle (150-200 m), and upper (50 m). The middle and upper parts have some lithological differences with the Ameghino Formation type sequence. On the Tres Amigos Nunatak, lithology is similar to the El Manco lower part and the minimum thickness is 100 m. The age of the Ameghino Formation on Sobral Peninsula is known from inoceramid bivalves and ammonites. The authors col-

lected fragments of belemnites, inoceramid and other bivalves, gastropods and ammonites. Some ammonite remains were determined as *Raimondiceras* sp. and *Blanfordiceras* sp. forms, indicative of a Tithonian-Berriasian age. The flora is composed of 9 specimens, all of them present in the Monte Flora association. The Tithonian-Berriasian age given by the fauna may be extrapolated to the taphoflora. The relationship between Ameghino Formation and the overlying lower Cretaceous Sobral conglomerates is discussed. Unconformity is highly probable in the basin margin, but both units could have been parts of the same tectonic induced fan-progradational marine cycle toward the basin center, where the contact should be conformable. (Auth. mod.)

E-43965

Bertels, A., Núñez, H.J., **Micropaleontology and paleomagnetism of Neogene sediments of the southwestern austral Atlantic Ocean: their hiatus** [Micropaleontología y paleomagnetismo de sedimentos del oceano atlantico sudoccidental austral en el neogeno: sus hiatus], *Revista española de micropaleontología*, 1989 21(3), p.391-408, In Spanish with English summary. 45 refs.

Micropaleontologic and magnetostratigraphic analysis of one core from the Maurice Ewing Bank, located in the eastern extreme of the Falkland Plateau, provides data on the geologic history of the site during the Neogene. Marine sedimentation took place during late Miocene (about 8.6 to about 6.8 m. y. B.P.), at the Early-Late Pliocene boundary (about 3.7 to about 2.9 m. y. B.P.) and during the Late Pliocene and Early Pleistocene (about 2.5 to about 1.7 m. y. B.P.). The age is based on the presence of the planktonic Foraminifera *Neoglobobulimina continua* (Blow), *Globobulimina puncticulata* (Dehayes), *Globobulimina inflata* d'Orbigny and *Globobulimina truncatulinoides malvinensis* Boltovskoy and Watanabe. At the site there is evidence of several hiatus, which represent erosional and/or non-depositional events; the major is estimated to have occurred during Late Miocene-Early Pliocene time. The hiatus, in general, are preceded and followed by intervals of total dissolution of carbonates (CCD). The Pliocene-Pleistocene boundary is located at the level of the first occurrence of *Globobulimina truncatulinoides malvinensis* accompanied by the massive presence of *Neoglobobulimina pachyderma* Ehrenberg; it coincides with an absolute age of 1.8 m. y. B.P. within the Olduvai event of the reverse Matuyama Epoch. (Auth. mod.)

E-43976

Ding, P., James, P.R., **Structural evolution of the Bunger Hills area of East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.13-17, 11 refs.

Several lithostratigraphic and tectonic units have been mapped in the Bunger Hills. A layer-parallel foliation formed during an early granulite-facies metamorphism. Four phases of ductile deformation include small F1 isoclinal or sheath folds, and regional F2 recumbent isoclines refolded to luniforms by regional tight upright F3 folds; a large shear-zone, bounded by a major thrust, cuts the F3 folds to produce a regional discordance, and it is the locus of intense amphibolite-facies retrogression. F4 regional ductile folding followed the intrusion of major charnockite bodies. Final cratonization of the Bunger Hills is indicated by reverse faults and dykes. (Auth.)

E-43977

James, P.R., Ding, P., Rankin, L., **Structural geology of the early Precambrian gneisses of northern Fold Island, Mawson Coast, East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.19-23, 15 refs.

The relative proportions of reworked Archaean Napier Complex and new Proterozoic crust within the approximately 1000 Ma Rayner Complex of East Antarctica is controversial. The high-grade granulite-facies gneisses of northern Fold I., within the Rayner Complex, comprise an early supracrustal sequence of quartzose paragneisses and mafic granulites interleaved with an intrusive series of layered pyroxene charnockitic gneisses. Mafic sheets within all the gneisses represent remnants of at least two suites of highly distorted mafic dykes, plus a suite of undeformed mafic dykes which retains a granulite-facies mineralogy. Five main generations of superposed fold events affected the gneisses; the three earlier ones were mostly isoclinal minor fold events. The earliest dykes may predate the earliest recognized deformation D1, while a major suite intruded post-D2 and pre-D3. The later two fold events produced major folds, with D4 forming a plunging inclined E-W overfold, and D5 refolding it. Late mylonites and pseudotachylite-generating faults record the excavation of the gneissic terrane. Pre-D3 activity is related to Napier Complex deformation, signifying that most of this area is Napier Complex-equivalent reworked during D3-5 and by semi-brittle deformation during the Rayner event. (Auth.)

E-43978

Young, D.N., Ellis, D.J., **Intrusive Mawson charnockites: evidence for a compressional plate margin setting of the Proterozoic mobile belt of East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.25-31, 29 refs.

The deformed and metamorphosed charnockites of the Mawson Coast have relict igneous features. High magmatic temperatures are indicated by partially melted granulite facies gneissic xenoliths, relict antiperthites with high Or, and rare coarsely exsolved pyroxenes. Estimates of the age and level of emplacement are 970 Ma and 6 kb. The charnockites are intermediate in composition, unlike most Proterozoic granitoids which are markedly felsic or bimodal. A high- and a low-Ti group of charnockites are recognized. Mafic tonalitic compositions are inferred for the parent magmas of both groups, although the high-Ti rocks are notably higher in K, Ti, P and light rare earth elements (LREE) than modern or Cordilleran tonalites. Derivation by melting of mainly mafic to intermediate crust is the preferred petrogenetic model, with an old sedimentary component to account for highly evolved initial Sr- and Nd-isotopic compositions. Many rocks have very high K/Na ratios for their high CaO and low SiO₂ contents, probably caused in part by K-feldspar accumulation. Depletions of heavy rare earth elements (HREE) in the low-Ti charnockites suggest that garnet was a residual phase in partial melting, which requires high pressures and a thickened crust. The tectonic setting is thus tentatively likened to an Andean or Himalayan type plate margin, with the inference that subduction was active during the Proterozoic. (Auth.)

E-43979

Krynauw, J.R., Watters, B.R., Hunter, D.R., Wilson, A.H., **Review of the field relations, petrology and geochemistry of the Borgmassivet intrusions in the Grunehogna Province, western Dronning Maud Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.33-39, 22 refs.

The tholeiitic, mid-Proterozoic Borgmassivet intrusions and Straumsnutane basalts of western Dronning Maud Land vary in composition from ultramafic to mafic. The intrusions and lavas in different nunatak areas display distinctive mineralogical, textural and intrusive characteristics, but the coherence of major and trace element data suggests that the magmas may have been consanguineous. Hydrothermal alteration and crustal contamination may have generated the wide range (about 800-1700 Ma) in isotopic age determinations. A model for extensive igneous activity during the closing stages of deposition in the Ritscherflya sedimentary basin is proposed. The present distribution of the Borgmassivet intrusions and Straumsnutane basalts reflects stratigraphically higher levels from west to east. It is suggested that western Dronning Maud Land is broken up into large tectonic blocks by the Penssökket-Jutulstraumen-type faults, within which a series of smaller blocks exist which represent tectonic readjustment following, or synchronous with, the major faulting event. (Auth.)

E-43980

Watters, B.R., Krynauw, J.R., Hunter, D.R., **Volcanic rocks of the Proterozoic Jutulstraumen Group in western Dronning Maud Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.41-46, 17 refs.

The Jutulstraumen Group comprises a sequence of Proterozoic basaltic to basaltic-andesite lava flows with minor intercalated volcanoclastic and siliciclastic beds. The minimum thickness of the group is about 850 m. The volcanic units conformably overlie a sedimentary platform sequence (Ahlmannryggen Group) and they display field characteristics typical of a subaerial succession. The presence of local shallow bodies of water at the time of emplacement is indicated by ripple marking and desiccation features in thin, discontinuous, tuffaceous sedimentary intercalations overlain by pillowed flows. The latter may grade laterally or vertically into hyaloclastite deposits which include isolated pillows. Similar units comprising relatively large pillow- or pod-like forms (up to 4 m in diameter) may represent accumulations of pahoehoe flow 'toes'. Major and trace element geochemistry indicates the presence of two distinct tholeiitic basalt types: a dominant variety having relatively low Ti and high Mg and Ca, and a subordinate series of flows, occurring near the top of the exposed succession, characterized by relatively high Ti, total Fe, Al, Zr, Y, P, V, Rb, Cs, Hf, Ta, Th, U and rare earth elements (REE). Both types display a similar restricted range of SiO₂ content (mean 52.6%). Chondrite-normalized spidergram patterns and abundances of trace and minor elements are consistent with their interpretation as continental tholeiites. (Auth.)

E-43981

Grantham, G.H., Hunter, D.R., **Timing and nature of faulting and jointing adjacent to the Penssökket, western Dronning Maud Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.47-51, 15 refs.

The incidence of faults and joints in H.U. Sverdrupfjella increases from the east towards the Penck Trough, which separates the high-grade Sverdrupfjella terrane from the relatively undeformed Precambrian Ritscherflya sedimentary and volcanic rocks to the west. Ages between 500 and 1000 Ma have been reported from gneisses of the Sverdrupfjella Group in Kirwanveggen, whereas the oldest ages yielded by mafic intrusions into the Ritscherflya sedimentary rocks are \pm 1700 Ma. The faults and joints show similar orientations and display dominantly ENE strikes. This orientation parallels that of the Penck Trough, and supports previous suggestions that the Penck Trough represents a major fracture system, probably associated with rifting. The jointing postdates the early Jurassic Tvora and Straumsvola alkaline complexes. The faults are normal, with downthrows to the NW. Dolerite dyke orientations in areas near Penck Trough differ from those of the faults and joints. Fault, joint and dyke trends from other areas nearby support the conclusions from Sverdrupfjella and show that faulting and jointing postdated the Jurassic volcanism. Recent reconstructions of Gondwana place Dronning Maud Land adjacent to Mozambique, and it is suggested that the Penck Trough faulting and jointing could represent a continuation of the western limb of the East African rift system. (Auth.)

E-43982

Allen, A.R., **Tectonic and metamorphic evolution of H.U. Sverdrupfjella, western Dronning Maud Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.53-60, 13 refs.

H.U. Sverdrupfjella, a polydeformed high-grade metamorphic terrane in western Dronning Maud Land, is separated from undeformed terranes to the west by the Jutulstraumen-Penck Trough (J-P) rift, a major crustal discontinuity displaying an early strike-slip and subsequent extensional history. H.U. Sverdrupfjella consists of basement and cover sequences in tectonic juxtaposition. The basement, composed of isoclinally interfolded orthogneiss and paragneiss complexes, with abundant meta-intrusive rocks, has undergone five phases of folding and later extensional deformation, whereas the cover is layered, almost devoid of meta-intrusive rocks, and displays only three fold episodes and later extension. A Jurassic alkaline intrusive suite dominates the western margin of the terrane adjacent to the J-P rift. F1 folds in the cover are correlated with F3 folds in the basement, and are interpreted as reflecting north-westerly directed thrusting which resulted in interleaving of the basement and cover. The late brittle extension is related to rifting on the J-P structure during the break-up of Gondwana. Five regional metamorphic episodes are recognized, of which only the latter three affected the cover. An early high pressure metamorphism (M1), immediately followed by isothermal decompression (M2), reflects rapid uplift of tectonically thickened continental crust. M3 accompanied thrusting whilst M4 was a widespread metasomatic episode which affected both basement and cover. Greenschist-facies retrogression (M5) was associated with late shearing. (Auth.)

E-43983

Groenewald, P.B., Hunter, D.R., **Granulites of northern H.U. Sverdrupfjella, western Dronning Maud Land: metamorphic history from garnet-pyroxene assemblages, coronas and hydration reactions**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.61-66, 21 refs.

The Proterozoic metamorphic terrane of H.U. Sverdrupfjella comprises a sequence of para- and orthogneisses. The amphibolite-facies mineralogy of these gneisses results from widespread regressive rehydration of granulite-facies assemblages, now preserved in mafic

lenses and boudins. Thermobarometry using core, rim and corona assemblages of garnet, pyroxene, plagioclase and quartz indicates initial conditions of 9-11 kb at 850 C, and retrogression to 6-7 kb at 650 C. The prograde path was in the sillimanite stability field which requires relatively high heat flow during crustal thickening. After an initial decompressive stage, retrogression by nearly isobaric cooling was followed by decompression and cooling. The data suggest that collision tectonics were involved in the evolution of H.U. Sverdrupfjella. (Auth.)

E-43984

Fielitz, W., Spaeth, G., **Structural survey of Precambrian rocks, Heimefrontfjella, western Neuschwabenland, with special reference to the basic dykes**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.67-72, 12 refs.

Heimefrontfjella consists of metavolcanic and metasedimentary rocks intruded by several phases of granitic rocks; most were metamorphosed to an amphibolite-facies grade and a few to a granulite-facies grade. A major shear zone, several kilometers wide, transects at least part of the mountain range. Although the metamorphic complex at Heimefrontfjella underwent polyphase deformation, only two phases of folding are clearly recognizable. The older set of folds trends NW-SE, the younger ones trend NE-SW. Numerous overthrusts in the northeastern part of Heimefrontfjella developed during the later phase of folding and this deformation also affected the shear zone. A number of predominantly N-S-trending subalkaline basalt dykes cut the metamorphic rocks. These range from weakly metamorphosed and undeformed dykes to amphibolitic and/or strongly sheared rocks. Although a few are probably of Mesozoic age, most belong to an older intrusive phase. Tectonic events affecting the Precambrian rocks of Heimefrontfjella and adjacent areas of the East Antarctic shield may be correlated with the Ross Orogeny and older orogenies in western Neuschwabenland, and with geological structures in eastern South Africa. (Auth.)

E-43985

Hungeling, A., Thyssen, F., **Reflection seismic measurements in western Neuschwabenland**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.73-76, 6 refs.

During the 1985-86 season reflection seismic measurements were carried out at 18 stations north of Heimefrontfjella (Kottas Mountains), to study the structure of the earth's crust. The differing ice thicknesses defined a graben-like structure extending NE-SW, parallel to Heimefrontfjella, with the mountains forming the southern boundary. This structure is more than 40 km wide and its total length has not yet been explored. The surface of the graben lies up to 1090 m below sea level and here the graben is filled with 2550 m thick ice. At most stations the ice is underlain by crystalline basement. Some seismograms show reflections from the 600 m thick Permian sedimentary rocks which partly overlie the crystalline basement. The calculated velocity of these sedimentary rocks is 4.7 km/s. The graben-like structure and the different depths of the sedimentary rock/basement boundary can be explained by large fractures in western Neuschwabenland. The crystalline rocks show reflection signals with typical anomalous and/or reverse move-out. At depths of 7-12 km and 28 km two boundaries can be recognized within the crust. The total thickness of the crust is estimated to be nearly 38 km. (Auth.)

E-43986

Shiraishi, K., **Geology and metamorphism of the Sör Rondane Mountains, East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.77-82, 21 refs.

The Sör Rondane Mountains are underlain by metamorphic rocks of probable Late Proterozoic age, and plutonic rocks and minor dykes of latest Proterozoic to Early Palaeozoic age. The majority of the rocks are pelitic, psammitic and intermediate gneisses, associated with subordinate basic and calc-silicate gneisses. Regional metamorphism was of medium-pressure type grading up to granulite-facies, and the peak temperature-pressure (T-P) conditions are estimated to have been 750-830 C and 7-8 kb. There has been extensive retrogression during mylonitization and plutonic intrusion, resulting in the restricted occurrence of kyanite in biotite that embays garnet in a sillimanite-bearing rock, and in the local development of granoblastic andalusite in some other sillimanite-bearing rocks. In the southwestern part of the mountains, a pronounced shear belt at least 10 km in width trends E-W. The shear belt consists mainly of gneissose tonalite containing abundant fragments of basic schist, and of minor amounts of psammitic schist. All these rocks have undergone intense mylonitization and cataclasis under conditions of the greenschist- to epidote-amphibolite-facies. The discrepancy between the compositions of the rocks and their metamorphic grade in the two regions suggest tectonic movements such as rifting in the latest Proterozoic to Early Palaeozoic. (Auth.)

E-43987

Hiroi, Y., Shiraishi, K., Motoyoshi, Y., **Late Proterozoic paired metamorphic complexes in East Antarctica, with special reference to the tectonic significance of ultramafic rocks**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.83-87, 22 refs.

The general geological and petrological characteristics of the Lützow-Holm and Yamato-Belgica complexes of eastern Queen Maud Land are summarized. The Lützow-Holm Complex is characterized by a continuous southwestward increase in metamorphic grade (progressive metamorphism of the medium-pressure type from amphibolite-to granulite-facies), prograde *P-T* (pressure-temperature) paths of rocks from earlier relatively high-pressure/low-temperature conditions to later lower-pressure/higher-temperature conditions, and low initial Sr-87/Sr-86 ratios for the metasedimentary rocks. The Yamato-Belgica Complex is characterized by widespread igneous activity and low-pressure type metamorphism. The presence of compositionally variable ultramafic rocks in isolated blocks that are unique to the Lützow-Holm Complex suggests that this complex formed in a suture zone between the older Yamato-Belgica Complex to the west and the Rayner Complex in the east. Continent-continent collision tectonics may therefore have been important in the development of this part of the East Antarctic shield. (Auth.)

E-43988

Kaul, M.K., Singh, R.K., Srivastava, D., Jayaram, S., Mukerji, S., **Petrographic and structural characteristics of a part of the East Antarctic craton, Queen Maud Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.89-94, 12 refs.

Geological investigations recorded here were carried out in central Queen Maud Land during the fifth Indian expedition to Antarctica. The rock types encountered were gneisses, amphibolites, basic granulites/charnockites and anorthosites. Petrological studies have

revealed that the metamorphic grade increases from sillimanite-almandine sub-facies of almandine-amphibolite facies in the Schirmacher Hills to pyroxene-granulite facies in the eastern part of the Wohlthat Mountains. Anorthosites of the Gruber Mountains are suggested to be Proterozoic massif type. A tectonic control for the anorthosite emplacement is suggested on the basis of their spatial disposition and megastructures in the area. (Auth.)

E-43989

Sengupta, S., **Structural and petrological evolution of basement rocks in the Schirmacher Hills, Queen Maud Land, East Antarctica (Extended abstract)**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.95-97, 7 refs.

The Precambrian rocks of the Schirmacher Hills area, belonging to the East Antarctic Charnockitic Province, record a complex history of repeated metamorphism, migmatization, folding and shearing. Compositional and textural differences can be used to subdivide the gneissic complex into six units in this area: streaky gneiss; augen gneiss; calc-gneiss, khondalite and associated migmatites; garnet-biotite gneiss; garnetiferous alaskite; and banded gneiss with intercalated pyroxene-granulite, charnockite and quartz-feldspathic gneiss. The present paper outlines the interrelationships between the structural and metamorphic events in the Schirmacher Hills area. (Auth.)

E-43990

Harley, S.L., **Metamorphic evolution of granulites from the Rauer Group, East Antarctica: evidence for decompression following Proterozoic collision**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.99-105, 20 refs.

Granulites from the Rauer Group, Prydz Bay, were metamorphosed at 840 C during an intense deformation event (D3), which produced flat-lying isoclinal folds in felsic orthogneisses. A spatial variation in pressures of metamorphism, from 6-7.5 kb in the northern part of the area to 7-8.5 kb in southern regions, is calculated. All rock types were intruded by basic dykes prior to folding about S-plunging upright folds in D4, a deformation which increased in intensity southwards and is thought to correlate with the approximately 960 Ma event documented for the Rayner Complex. Post-deformational symplektitic reaction textures in a variety of rock types indicate substantial decompression to calculated pressures of 3-5 kb (northern outcrops) and 5-6 kb (southern outcrops) at 750 C. This *P-T* evolution, which indicates a uniform unroofing of some 6-9 km while lower-mid-crustal temperatures only decreased by about 100 C, is interpreted to represent the later stages of a prolonged collision-related thermal evolution. (Auth.)

E-43991

Hofmann, J., **Fault tectonics and magmatic ages in the Jetty Oasis area, Mac. Robertson Land: a contribution to the Lambert rift development**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.107-112, 17 refs.

Structural and geochronological investigations (K-Ar data) of Archaean-Proterozoic basement rocks and Permian sedimentary rocks exposed in the Platforma Kamenistaja and the Else Platform, Mac. Robertson Land, are discussed. Both platforms show patterns of meridional and latitudinal faults connected with igneous intrusions. The meridional system consists of N-S to NE-SW-trending normal

and oblique-slip faults dipping 55-40W or NW. Late Carboniferous mafic dykes and Early Triassic porphyries and quartz veins followed this fault system, which was re-activated repeatedly during Mesozoic and Cenozoic times. It is regarded as an antithetic system of the western main fault zone of the Lambert rift. The latitudinal system is represented by strike-slip faults, dykes and small pipes of Early Cretaceous brecciated and massive monchiquites. Magmatic and hydrothermal activity at the western rift margin, between 70 and 74S, are discussed with reference to published data. (Auth.)

E-43992

Marsh, P.D., **Major fracture trends near the western margin of East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.113-116, 35 refs.

Comparison of the trends of ice-surface lineaments seen in satellite imagery of Coats Land and western Dronning Maud Land, with fracture directions and structural trends known from outcrop studies, supports the conclusion that the lineaments provide a summary of major fault trends in the region. Some are parallel to pre-Mesozoic trends but their present expression probably relates mainly to structures associated with Mesozoic rifting. The three most persistent trends intersect at approximately 120 deg. and are parallel to adjacent rifted margins of East Antarctica. It is suggested that they are associated with a tri-radial rift system formed during the early stage of break-up between east and west Gondwana. The trends revealed by the imagery may aid in defining the shape of major structures identified by geophysical studies and the continental fragments in the adjacent part of West Antarctica. (Auth.)

E-43993

Brewer, T.S., Clarkson, P.D., **Mesozoic magmatism in Greater Antarctica: implications for Precambrian plate tectonics**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.117-121, 26 refs.

Mesozoic tholeiites from Coats Land and western Dronning Maud Land can be divided into two suites, characterized by their Ti content. These tholeiites have subduction-related trace element signatures which contrast with their known intracontinental setting. Similar geochemical signatures have been noted for the Ferrar Supergroup in the Transantarctic Mountains. Sm-Nd-isotope studies suggest that the high-Ti group have an age of about 1000 Ma which contrasts with the known emplacement age of about 160 Ma. The geochemical data suggest that the tholeiites were derived in part from an enriched source region, probably continental lithosphere. This lithosphere was probably produced during a Precambrian subduction event. Due to their proximity to the Transantarctic Mountains, the Cenozoic alkali basalts of Marie Byrd Land and the McMurdo Volcanic Group might be expected to show a similar trace element signature to the Mesozoic tholeiites. However, the available data suggest a depleted source giving rise to ocean-island type magmas. It is suggested that the Mesozoic tholeiites were derived, in part, from an old enriched lithospheric source distinct from the source of the Cenozoic magmas. This implies that the lithosphere beneath the Transantarctic Mountains is very different from that beneath Marie Byrd Land, which represents an exotic accreted fragment. (Auth.)

E-43994

Paech, H.-J., Hahne, K., Vogler, P., **Sedimentary palaeoenvironments of the Rhiphaean Turnpike Bluff Group, Shackleton Range**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.123-128, 11 refs.

A sedimentological characterization of the Rhiphaean Turnpike Bluff Group is given on the basis of field observations compiled during the 22nd Soviet Antarctic Expedition, microscope studies, and whole-rock mineral, geochemical and isotopic analyses. An incipient weathering crust on Turnpike Bluff Group sediments is indicated by depletion of Zn, Co, Mn, Cu and Ba enrichment of the Al₂O₃ content, and oxidation of the Fe compounds. The overlying quartzite sequence (attaining 10 m in thickness) is considered to be of aeolian origin. In the following carbonate-bearing formation (about 70 m in thickness), sedimentation occurred under shallow marine conditions. Evidently, the subsequent history was controlled by continuing subsidence which was almost completely compensated by arenite-pelite alternations of >1 km thickness. There are no indications of deep-water turbidity currents within this succession. The source area of the Turnpike Bluff Group was to the northeast of the present outcrops. The Turnpike Bluff Group was evidently deposited in an epicratonic basin despite the subsequent 'Pan-African' weak deformations which are associated with upthrusting of rigid basement blocks. (Auth.)

E-43995

Adams, C.J., Whitla, P.F., **Precambrian ancestry of the Asgard Formation (Skelton Group): Rb-Sr age of basement metamorphic rocks in the Dry Valley region, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.129-135, 14 refs.

Rb-Sr whole-rock isochron ages are reported for greenschist-amphibolite-facies quartzo-feldspathic schists, pelitic schists and marbles from the Asgard Formation (Skelton Group) in the lower Wright and Victoria Valleys, Antarctica. Mica-schists (pelitic protolithology) give evidence of regional metamorphism at least 615 Ma ago, whilst quartzo-feldspathic schists (psammite protolithology) give evidence of incomplete strontium isotopic homogenization at about 670 Ma. Rb-Sr ages of impure marbles are 840 Ma, suggesting a late Precambrian age of sedimentation and correlation with the Koettlitz Group of southern Victoria Land rather than the Byrd Group (Cambrian) in the central Transantarctic Mountains. (Auth.)

E-43996

Skinner, D.N.B., **Priestley Formation, Terra Nova Bay, and its regional significance**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.137-141, 15 refs.

In spite of isoclinal, two-fold deformation and low- to medium-grade metamorphism, preserved sedimentary features in the Late Proterozoic Priestley Formation suggest a range of depositional environments. The lower 880 m is a fining-upwards sequence of quartzose, pelitic sandstone to siltstone interbedded with thin shale, suggestive of deposition in an upper mid-fan environment. A sudden change to a 480 m thick pyritic-ferruginous and mud cracked quartzite-carbonate sequence implies a rapid shallowing to a restricted anoxic basin. The following 50 m of thinly interbedded calcareous quartz sandstone and sandy shale, and 300 m of ferruginous interbedded sandstone and pelitic siltstone have undergone large-scale soft sediment deformation and mark a further change to a more unstable

environment. The overlying 700 m are still pyritic and ferruginous but show an increasing influx of quartzose sandy detritus, with graphite and amphibolitic tuffaceous sandstone. Above this quartzose and volcanoclastic sequence, the section ends with 60 m of amphibolitized pillow lava interlayered with volcanoclastic sandstone and quartzite. A suitable environment for the anoxic-sandy-volcanic sequence is a starved lagoon behind an encroaching prograding sand barrier, perhaps bounding the outer shelf edge adjacent to the East Antarctic Proterozoic craton, and within a volcanic back-arc basin. (Auth.)

E-43997

Stump, E., Korsch, R.J., Edgerton, D.G., **Myth of the Nimrod and Beardmore orogenies**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.143-147, 24 refs.

The Beardmore Orogeny was designated to encompass Late Proterozoic deformation and magmatism in the Transantarctic Mountains. An angular unconformity in the Nimrod Glacier area, with Lower Cambrian Shackleton Limestone overlying folded Goldie Formation, indicates that the deformation was Precambrian. In the Cobham Range the Goldie Formation conformably overlies the Cobham Formation. The Goldie and Cobham formations were both deformed during two separate events. The first (Precambrian) produced an axial-plane cleavage oriented N-S and mesofolds with an eastward vergence. The second, associated with folding of the Shackleton Limestone (Cambro-Ordovician Ross Orogeny), produced a NW-SE-oriented axial-plane cleavage and mesofolds with a westward vergence. Outcrops of the Nimrod Group in the Miller Range were deformed and metamorphosed during the Nimrod Orogeny. Five episodes of deformation have been identified in this group, the first three being assigned to the Nimrod Orogeny. Both mesofolds and a shear zone associated with the Nimrod Orogeny have eastward vergence. It is proposed that the Cobham Formation is a lower-grade correlative of a part of the Nimrod Group and that the Precambrian, E-vergent deformation of the Beardmore and Nimrod groups is equivalent. This implies that the Nimrod and Beardmore orogenies were the same event, with more intense deformation and metamorphism of the Miller Range decreasing eastwards. (Auth.)

E-43998

Adams, C.J., Höhndorf, A., **Age of the metamorphic basement of the Salamander and Lanterman ranges, northern Victoria Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.149-153, 18 refs.

Rb-Sr whole-rock isochron ages are reported for greenschist-facies metasedimentary rocks in the Salamander and Lanterman Ranges, northern Victoria Land; these rocks are probable correlatives of the Wilson Group basement metamorphic rocks in the Usarp Mountains. The ages, 558 Ma and 550 Ma, respectively (initial Sr-87/Sr-86 ratios of 0.7156 and 0.7155), indicate an (?) Early Cambrian metamorphism of the Wilson Group metamorphic rocks, and correlate with similar metamorphic ages for the Rennick schists in the Usarp Mountains. This event probably predates mid-Cambrian-Early Ordovician sedimentation (Bowers Supergroup) in northern Victoria Land. (Auth.)

E-43999

Buggisch, W., Kleinschmidt, G., **Recovery and recrystallization of quartz and 'crystallinity' of illite in the Bowers and Robertson Bay terranes, northern Victoria Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.155-159, 25 refs.

Metamorphism of the rocks of the Bowers and Robertson Bay terranes (BT and RBT) in northern Victoria Land has been studied by means of illite 'crystallinity' and the behavior of quartz in deformed veins. Low-grade metamorphism, especially within RBT, is uniform over an area of 150 x 300 sq km. Such metamorphism required a uniform overburden of at least 10-15 km thickness above the RBT rocks. This cover could not have been entirely depositional but must also have involved tectonic processes. Two feasible mechanisms for this crustal thickening are: (a) BT was thrust eastwards over RBT for more than 100 km; (b) thickening was caused by multiple thrusting, mainly within RBT. The first mechanism could be proven if a klippe of BT was shown to exist in eastern RBT, and the second by the existence of more than the two thrust faults known at present (BT/RBT and 30 km east of RBT's western margin). (Auth.)

E-44000

Roland, N.W., **Boundary of the east antarctic craton on the Pacific margin**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.161-165, 23 refs.

Along the Pacific coast of northern Victoria Land (NVL), three different terranes are encountered; from east to west these are: the Robertson Bay, the Bowers, and the Wilson terranes. The high-grade metamorphic rocks of the Wilson Terrane comply with the requirements of a platform and have to be assigned to the East Antarctic craton. Though radiometric age determinations mainly provide ages related to the Ross Orogeny, Late Precambrian ages also appear, which may point to the existence of an older orogeny in NVL. There are indications that a rejuvenation took place during the Ross Orogeny. New evidence for the positioning of the boundary between shield and Precambrian platform was obtained by the aeromagnetic survey of GANOVEX IV in 1984-85. The shield is inferred to begin west of the Priestley Glacier, whilst the metamorphics of the Precambrian platform extend at least to the Bowers Terrane. (Auth.)

E-44001

Lucchitta, B.K., Bowell, J.A., Tessensohn, F., Behrendt, J.C., **Northern Victoria Land, Antarctica: hybrid geological, aeromagnetic and Landsat-physiographic maps**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.167-169, 8 refs.

Correlations between geological units and aeromagnetic anomalies were facilitated by superposing a generalized geological map of an area in northern Victoria Land on Landsat physiography, and on aeromagnetic anomalies displayed in shaded relief. The hybrid maps show that basement rocks of the Wilson and Bowers groups and the Admiralty Intrusives have low magnetic relief, that Jurassic and Cenozoic mafic rocks correlate well with positive anomalies, and that small outcrops of Cenozoic alkalic intrusions coincide with conspicuous positive anomalies that may reflect more mafic igneous differentiates at depth. (Auth.)

E-44002

Rowell, A.J., Rees, M.N., **Setting and significance of the Shackleton Limestone, central Transantarctic Mountains**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.171-175, 28 refs.

During the Cambrian, a carbonate platform was developed intermittently along the palaeo-Pacific margin of Gondwana. The Shackleton Limestone provides an isolated record of its Early Cambrian history in Antarctica. Although this formation is strongly deformed, its lithofacies associations show that most of it accumulated in shallow subtidal conditions and that oolite bars and sand sheets, together with *Epiphyton*-archaeocyathan build-ups, developed in higher energy regimes. Similarity of rock type and fauna are consistent with the Shackleton Limestone being a continuation of the South Australian platform, and suggest that they developed in broadly comparable settings. Outboard of the carbonate platform, shallow-water and terrestrial volcanic and volcanoclastic rocks are associated with shallow-water carbonate lithofacies. Deep-water lithologies are unknown. Platform development along the margin was diachronous and in the Weddell Sea area was not extensive until the Middle Cambrian. In this region, the platform is truncated by Mesozoic faulting and location of its displaced remnants are unknown. Conceivably, the Ellsworth Mountains are a former outboard part of it. Faunal and structural data suggest that a fault with major lateral displacement separates the Pensacola Mountains and Shackleton Range. (Auth.)

E-44040

Krynauw, J.R., Hunter, D.R., Wilson, A.H., **Reassessment of the Nils Jörgennutane suite in the Ahlmannryggen**, *South African journal of antarctic research*, 1990 20(1), p.2-8, 16 refs.

The Nils Jörgennutane suite, which has been recognized in the Ahlmann Ridge by previous authors, is described and discussed. Two lithologies within the suite are recognized: a quartz monzonite to quartz monzodiorite group, which occurs at the type locality, and granite (*sensu stricto*) from the Grunehogna area. The monzonitic rocks are shown to be late stage fractionation products of Borgmassivet intrusions, whereas the granites are small-scale products of anatectic melting of wet sediments adjacent to Borgmassivet intrusions. Neither of the two groups warrants status as a separate suite, and it is proposed that the use of the term "Nils Jörgennutane suite" be discontinued. A revised definition of the Borgmassivet intrusions is suggested and the formal terms Borgmassivet Suite and Grunehogna Granite are proposed. (Auth.)

E-44045

De Wit, M.J., **Gondwana research: new breakthrough, old supercontinent**, *South African journal of science*, Nov.-Dec. 1990 86(11-12), p.479-483.

Geological maps of Gondwana are discussed and illustrated. Plate tectonics and reconstruction techniques are reviewed. The point is made that advanced computer technology and database handling herald a new time for reintegration and probing for deeper knowledge of Gondwana, the life and times of supercontinents, and the working of our planet.

E-44048

Kim, W.H., Park, B.K., **Marine diatoms from the Late Quaternary sediments in the Marian Cove, King George Island, Antarctica**, Collected reprints. Vol.5, Seoul, Korea Ocean Research and Development Institute, 1988, p.341-365, Reprint from J. Paleont. Soc. Korea, 4 (1988). Refs. p.362-365.

Antarctic diatom floras are analyzed from the Quaternary sediments collected near the Antarctic Convergence in austral summer, 1988. The floras are well preserved and diverse, comprising fifty to fifty-nine species in each sediment. Common dissolution-prone species and rare dissolution-resistant species included indicate good preservation and represent the oceanographic conditions where they derived. The diatom floras include no extinct species, indicating that no reworking has occurred in the sampling sites. The diatom assemblages consist of antarctic endemics, subantarctic indicators, bipolar species, neritic dwellers, cosmopolitans, and cryophilic/epontic species. Among them, antarctic endemics comprise 18.2% to 24.7% and subantarctic indicators 6.9% to 13.4% of the total population. The dominant species is *Pseudogomphonema groenlandicum*; the dominant genus is *Nitzschia*. Several age diagnostic species included suggest that the sediments were deposited during Late Quaternary. (Auth. mod.)

E-44049

Splettstoesser, J.F., ed, Dreschhoff, G.A.M., ed, **Mineral resources potential of Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, 310p., Refs. passim. For individual papers see 45-2802 through 45-2817 or A-44066, A-44067, B-44065, E-44050 through E-44061, E-44063, F-44062 and G-44064.

This volume is a collection of papers attempting to summarize current factual knowledge and scientific data related to issues of mineral resources in Antarctica. The first two papers provide an overview of the geologic setting and history of the antarctic continent. The next seven papers lead directly into differing aspects of various potential mineral resources in Antarctica. These are followed by papers discussing coal and hydrocarbons, freshwater resources and manganese. The current logistics program of the United States has been used as an example of the possibilities and difficulties facing operations on the icy continent. Tourism has also been included as a resource within the framework of environmental impact. Finally, the political questions have been addressed, and the report "The Antarctic Minerals Convention" by Lee Kimball (1988) has been reprinted in full and added to this volume. (Auth. mod.)

E-44050

Craddock, C., **Mineral resources of Gondwanaland**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.1-6, 25 refs.

This introductory paper is a short summary of the mineral resources of Gondwanaland; it offers a basis for expecting the existence of mineral resources in Antarctica. The hydrocarbon accumulations found to date on the shield areas are modest, but significant fields occur in young deformed belts around the edges of Gondwanaland and young basins associated with the fragmentation of Gondwanaland. Coal beds are known in South America, Africa, India, Australia, New Zealand, and Antarctica, especially in the upper Paleozoic-lower Mesozoic strata of the Gondwana sequence. Uranium deposits occur in South America, Africa, India, and Australia, mainly as vein deposits, unconformity deposits, sandstone deposits, and fossil placer deposits. The wide distribution of mineral resources across the known pieces of Gondwanaland implies their probable existence within the least known piece—Antarctica. Because of limited rock exposure and hostile environment, a search for mineral resources in Antarctica would be difficult and expensive. Should promising mineral deposits be found, their exploitation would require both large investments and the development of new technology. (Auth. mod.)

E-44051

Wilsher, W.A., De Wit, M.J., **Toward a quantitative mineral resource assessment of Antarctica from a Gondwana perspective**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.7-14, 15 refs.

Since a new, detailed geological map and database (including geological and partially tectonic and geochronological data) of Gondwana have been installed on the Intergraph computer system, Gondwana research has extended into the field of geochemistry, with particular emphasis on the distribution of some transition elements (e.g., Au, Cu, Zn) within the mineral deposits across Gondwana. The authors are in the process of constructing quantitative resource maps (metal-anomaly maps) of Gondwana together with an accompanying metallogenic database. The database comprises alphanumeric minerals data and is linked to the existing geological database through the digitized Gondwana map. Because the Intergraph system offers the capability of rapidly linking graphics and nongraphics databases, interactive enquiries and manipulations of the nongraphics data can be made from the digitized map. By pursuing a relationship between metallogenesis and plate tectonics, the authors propose to formulate an assessment of antarctica's mineral endowment within the framework of the Gondwana Earth science database and mineral economics theory (i.e., wealth models). (Auth. mod.)

E-44052

Ford, A.B., **Dufek intrusion of Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.15-32, 118 refs.

The mostly ice-covered, stratiform mafic Dufek intrusion of the northern Pensacola Mountains is one of the world's largest igneous bodies of this type. It has many petrologic similarities with resource-rich intrusions such as the Bushveld Complex (South Africa) and the Stillwater Complex (Montana), but its potential for resources is poorly known. The occurrence in the Dufek intrusion of magmatic ore deposits similar to those of other layered mafic intrusions seems likely. Among possible resources, platinum group elements (PGE) would have greatest economic feasibility for exploitation. The Dufek intrusion is of Jurassic age and coeval with Ferrar magmatism of the Transantarctic Mountains. It was emplaced within a multiple-deformed mobile belt of Triassic and older age adjoining the craton of East Antarctica. Cumulates of earliest origin, presumably in part ultramafic, and those of a 2- to 3 km thick intermediate interval are not exposed. Mafic cumulates of nearly 2 km thick exposed sections in Dufek Massif and stratigraphically higher in the Forrestal Range show chemical and mineralogic differentiation trends of Fe enrichment comparable to those of other major stratiform intrusions. Sulfide minerals are markedly more abundant in the higher part of the intrusion, where highest PGE abundances are found. However, a possible comparison with the Bushveld's PGE-rich Merensky Reef suggests greatest resource potential in the Dufek's concealed basal section. (Auth. mod.)

E-44053

De Wit, M.J., Kruger, F.J., **Economic potential of the Dufek Complex**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.33-52, 94 refs.

A geological and geochemical comparison of the Mesozoic Dufek and Proterozoic Bushveld complexes reveals substantial similarities between these two mega layered intrusions. In particular, their tectonic setting, isotopic characteristics, and history of differentiation,

including the presence of "reversals" which are indicative of magma addition, can be closely matched. In the Bushveld Complex, magma addition and mixing are the primary causes for the large platinum group element (PGE) and chromite deposits, and this may well be the case in the Dufek Complex. Nevertheless, the Dufek magmas differed from those of the Bushveld Complex in that clinopyroxene was probably always an important liquidus phase and the precipitation of chromite was suppressed. The probable lack of chromite in the Dufek Complex would preclude the presence of chromite-hosted PGE deposits such as the UG2 of the Bushveld Complex. If chromite was essential for PGE precipitation, the Dufek would be a poor prospect. However, the Merensky Reef type of deposits are probably the product of large-scale magma mixing with concomitant immiscible sulfide precipitation. The probability of a Merensky Reef-type PGE deposit in the Dufek Complex is estimated to be about 75%. Should such a deposit be realized, then, given the present-day platinum price, economic models indicate that it could be profitably mined. (Auth. mod.)

E-44054

Beike, D., **Engineering economic evaluation of mining in Antarctica: a case study of platinum**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.53-67, 23 refs.

This study focuses on the engineering and economics of mining platinum group metals and gold from the Dufek intrusion, which is a Jurassic layered mafic intrusion. Except for the Bushveld Complex in South Africa, it is far larger than any other complex of this type. Chromium, copper, and platinum group metals are considered as speculative resources in this intrusion. There is special interest in the platinum group metals. These are expected mainly in the hidden lower portion of the Dufek intrusion. Possible mining activity could take place in this intrusion. Logistics, thickness of the ice cover, permafrost, and extremely low temperatures create problems for a hypothetical mining operation and impose hazards for transportation. Economic considerations show no reason to believe that in the near future extraction of minerals could be performed profitably under current cost and price regimes. However, with increasing commodity prices and a tightening of the market situation a favorable economic environment could develop. In 1991 the Antarctic Treaty will come up for review, and questions about a mineral development regime are of timely importance. The problem of mineral rights acquisition has to be solved before any mining can be legally performed. (Auth. mod.)

E-44055

Pride, D.E., Cox, C.A., Moody, S.V., Conelea, R.R., Rosen, M.A., **Investigation of mineralization in the South Shetland Islands, Gerlache Strait, and Anvers Island, northern Antarctic Peninsula**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.69-94, 68 refs.

Twenty localities in the South Shetland Is., the Gerlache Strait, and southern Anvers I. were examined for their potential as sites of "Andean-type" porphyry and related base and precious metal mineralization. Field studies consisted of geologic mapping and sampling for petrographic studies and trace element analysis (Cu, Pb, Zn, Au, Ag, Mo, W). Copper, lead, and zinc are present in most of the localities that were examined, and molybdenum, gold, and silver also may be important components of the mineralization. Four localities have been identified as possible sites of porphyry and related base and precious metal mineralization: east of Palmer Station, southwestern Anvers I.; along the coast north of Bahia Frei in the Gerlache Strait; northeast of False Bay, Livingston I.; and north of Johnsons Dock

(Hurd Peninsula), Livingston I. Additional study will be required to define the resource potential of these localities. (Auth.)

E-44056

Maurette, M., **Collection of diverse micrometeorites recovered from 100 tonnes of antarctic blue ice**, *Nature*, May 2, 1991 351(6321), p.44-47, 29 refs.

Melting and filtering of about 100 tons of blue ice near Cap Prudhomme yielded 7,500 irregular, friable particles and about 1,500 melted spherules, about 100 microns in size, both showing a chondritic composition suggestive of an extraterrestrial origin. The composition and texture were analyzed of 51 irregular particles and 25 spherules; the irregular particles appear to be unmelted, and have similarities with the fine-grained matrix of primitive carbonaceous chondrites, but are extremely diverse in composition. Isotopic analysis of trapped neon confirms an extraterrestrial origin for 16 of 47 irregular particles and 2 of 19 spherules studied, and strongly suggests that they were exposed in space as micrometeoroids. These large antarctic micrometeorites constitute a new family—or at least a new population—of solar system objects, in a mass range corresponding to the bulk of extraterrestrial material accreted by the Earth today. (Auth. mod.)

E-44057

Kyle, P.R., **Geothermal resources of Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.117-123, 58 refs.

The potential for geothermal resources in the ice-free areas of Antarctica is evaluated in five categories: conduction-dominated thermal regimes, igneous-related geothermal systems, hydrothermal convection systems, low-temperature geothermal waters, and geopressured-geothermal resources. Antarctica probably lacks major heat flow sources and large hydrothermal convective systems capable of developing conventional geothermal electric power stations. More heat flow measurements are necessary near active volcanoes such as Mount Erebus and along tectonically active areas such as the Transantarctic Mountains to completely exclude the possibility of hot dry rock resources. (Auth.)

E-44058

Tingey, R.J., **Banded iron formations in East Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.125-131.

Banded iron formations are common in the basement shield areas of several continents, and it is not surprising that they should be present in Antarctica. They have been recognized at a number of localities extending around the coast from Enderby Land to Wilkes Land in East Antarctica. The Mount Ruker exposures in the southern Prince Charles Mountains are regarded by some investigators as large enough to be classified as a potential ore deposit. However, exploitation of this resource is unlikely for a number of reasons. The iron content averages 33.5%, and ore of this grade would normally require beneficiation, most probably at the mine site. The high cost of mining and the expense of ocean transport from Antarctica to a steel mill would further inhibit exploitation. In addition, the phosphorus content of the ores is marginal for modern steel-making methods. All of these factors combine to make it unlikely that commercial development of these resources will be possible in the foreseeable future. (Auth.)

E-44059

Coates, D.A., Stricker, G.D., Landis, E.R., **Coal geology, coal quality, and coal resources in Permian rocks of the Beacon Supergroup, Transantarctic Mountains, Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.133-162, 79 refs.

Permian coal beds occur within a fluvial sedimentary sequence in the Victoria Group of the Beacon Supergroup from the Ohio Range to northern Victoria Land, a 200-km-long belt in the Transantarctic Mountains. Although coal beds as thick as 10.7 m have been reported, most beds are thinner than 2 m. In northern Victoria Land the Takrouna Formation contains coal in the small North Victoria Basin; in southern Victoria Land the larger South Victoria Basin contains the Weller Coal Measures; and the southernmost and largest basin, Nimrod-Ohio Basin, from the Nimrod Glacier to the Ohio Range, contains the Buckley Formation and its equivalents. One hundred forty-four published analyses of Permian coal from this region show that ash contents range from 3.2 to almost 50% with an arithmetic mean of 15.3%, and sulfur ranges from 0.0 to 4.8% with an arithmetic mean of 0.57%. Apparent rank of the coals ranges from high-volatile C bituminous coal to anthracite, but most of the coal samples have apparent ranks of low-volatile bituminous coal and semianthracite. Paucity of data on coal thickness and distribution dictates that coal resource estimates be assigned to the hypothetical classification. Calculations based on published geologic maps, geologic descriptions, and measured sections indicate hypothetical resources of 3 billion metric tons in the North Victoria Basin, 50 billion metric tons in the South Victoria Basin, and 100 billion metric tons in the Nimrod-Ohio Basin. (Auth. mod.)

E-44060

Behrendt, J.C., **Recent geophysical and geological research in Antarctica related to the assessment of petroleum resources and potential environmental hazards to their development**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.163-174, 149 refs.

During the 6-year negotiation of and adoption of the Convention on the Regulation of Antarctic Mineral Resources Activities on June 2, 1988, various countries increased their attention to the possibility of exploitation of Antarctica's petroleum resources, which are covered by this treaty. However, there are no known petroleum resources in Antarctica, and scientific information is lacking to adequately assess any undiscovered resources or the possible environmental hazards to their development. Scientific research carried out in Antarctica since the International Geophysical Year (1957-1958) has provided a great deal of information on the geological framework of this ice-covered continent and its margin and has found general indications of the types of hazards that must be considered. Antarctica covers a vast area, and likely supergiant oil fields of the type to be exploited would be tiny (e.g., a few tens of kilometers across) in comparison. Any petroleum resources located in Antarctica will be found by applying the knowledge, techniques, and experience gained developing oil fields in other parts of the world and would, therefore, be other examples of general cases; in contrast, the antarctic environment and its associated hazards must be considered unique. (Auth.)

E-44061

Anderson, J.B., **Geology and hydrocarbon potential of the antarctic continental margin**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.175-201, 134 refs.

Seismic surveys have been conducted on most of the seasonally ice-free portions of the antarctic continental margin, but drilling has been limited to only a few areas. These data, coupled with the results of geological studies of coastal outcrops and information from the conjugate Gondwana continents, are used to infer the subsurface geology of 5 different sectors of the antarctic continental margin and to assess their hydrocarbon potential. Potential source rocks are believed to exist on most portions of the continental margin and are buried deep enough, or are subjected to high enough geothermal heat, for hydrocarbon maturation to have occurred in these deposits. Suitable reservoir rocks are also considered to be widespread on the margin, with the possible exception of that portion of the Pacific-Antarctic margin situated north of the Tula Fracture Zone and including the Bransfield Basin. Structural traps are generally confined to the older sequences on the margin that fill early rift basins. Stratigraphic traps are probably common. (Auth.)

E-44063

Frakes, L.A., Moreton, D.L.E., **Manganese nodule provinces of the southern ocean**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.217-221, 15 refs.

Manganese nodules known from bottom photographs and samples in dredges and cores occur in a belt as wide as 400 km on the seafloor around Antarctica. The majority of nodule fields appear to be of no economic potential in the foreseeable future, because the mean concentrations of Ni, Cu, and Co are low. However, it is emphasized that study of antarctic nodules is at the reconnaissance stage, and there could be large fields of high metal values yet undiscovered, as well as potential mine sites within known fields. (Auth.)

E-44083

Bucher Nurminen, K., Ohta, Y., Austrheim, H., Dallmann, W., **Geological observations in Gjelsvikfjella and Mühlig-Hofmannfjella**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.91-100, 7 refs.

NARE 1989/90 revealed that large portions of the western Mühlig-Hofmannfjella are dominated by a massive unfoliated or weakly foliated medium-grained rock type of granitic bulk composition. The granitic rocks display at some places a granulite facies mineralogy (and a distinct brown weathering color). At other places it contains a typical amphibolite facies mineralogy. The boundary between the two versions of the same rock is usually sharp but geometrically very complex. The contact between granulite facies charnockite and amphibolite facies granite is generally very sharp and the contact zone is in the order of grain size dimension. Locally, both rock types display a weak foliation with a well developed crenulation cleavage. The deformation textures are usually continuous across the sharp boundary of the color change, and therefore are clearly older than the process which was responsible for generating the granulite-amphibolite facies boundary. The granulite-amphibolite facies transition is related to a series of continuous dehydration reactions. The nature of these reactions depends on the bulk rock chemistry and the amphibolite-facies mineralogy. All dehydration reactions require heat to proceed; their progress, however, may often be a consequence of a changing chemical potential of H₂O (and possible associated changes in fluid composition) rather than a simple increase in temperature. There is ample field evidence for the regional importance of the white-wash process. Clear evidence for the hydration of granulites is texturally restricted to fracture systems, late dykes, netveins and xenoliths.

E-44089

Laird, M.G., **Lower-mid-Palaeozoic sedimentation and tectonic patterns on the palaeo-Pacific margin of Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.177-185, 44 refs.

Regional patterns of sedimentation, tectonics, and magmatism in the Lower-mid-Palaeozoic pre-Beacon basement rocks of Antarctica suggest that they can be grouped into two major sedimentary-tectonic provinces. In the Transantarctic Mountains Province, which includes the Ellsworth Mountains and most of the Transantarctic Mountains, Lower Palaeozoic rocks constitute two contrasting sequences bounded by unconformities or by major lithofacies disjunctions. Cambrian rocks consist largely of shallow-marine shelf deposits, while strata of Ordovician-(?)Early Devonian age comprise coarse mainly non-marine post-orogenic clastic sediments. An important Early Devonian(?) tectonic event (Shackleton Event) caused uplift, erosion, and, locally, folding before deposition of the Beacon Supergroup. By contrast, in the Ross Sea Province, which includes Marie Byrd Land and much of northern Victoria Land, Lower Palaeozoic sedimentation, restricted to the Cambrian-Early Ordovician, occurred in submarine fan or island arc environments. Rocks of the province were affected by Middle Devonian-Early Carboniferous igneous activity and deformation (Borchgrevink Event). The Ross Sea Province represents a collage of terranes which, until Gondwana break-up time, probably included the then contiguous Campbell Plateau and parts of New Zealand and south-eastern Australia. This continent-sized allochthonous block probably accreted to East Antarctica in the mid-Devonian-Carboniferous. (Auth.)

E-44090

Rees, M.N., Rowell, A.J., **Pre-Devonian Palaeozoic clastics of the central Transantarctic Mountains: stratigraphy and depositional settings**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.187-192, 17 refs.

Pre-Devonian clastic beds forming the Douglas Conglomerate crop out in the Churchill Mountains where locally they rest unconformably on the Lower Cambrian Shackleton Limestone. Following at least one episode of deformation, the Shackleton Limestone was uplifted and eroded and contributed extensively to the deposition of the Douglas Conglomerate. Clasts derived from it are a significant component of the polymictic terrigenous-rich sequences that had a variety of sources and constitute most of the material in the limestone breccia beds of the Douglas Conglomerate. Following deposition and prior to the Devonian, the Douglas Conglomerate was subjected to at least three periods of deformation. The sediment was deposited by a variety of mechanisms in alluvial fan environments, and in marine and possibly lacustrine environments of fan or braid deltas. Pebble-boulder clast-supported conglomerates with minor amounts of sandstone were deposited by: density-modified mass flows in proximal alluvial fans; deep high-discharge streams in main channels; shallow braided stream and sheet floods in interchannel areas; and by flood discharge in distal settings. Coarse-grained turbidites and bioturbated silty limestone represent submarine deposition associated with fan or braid deltas. Fine-grained terrigenous rocks with thin Bouma sequences and abundant ripples, but lacking trace or body fossils, may signify lacustrine depositional environments. (Auth.)

E-44091

Bradshaw, M.A., **Devonian Pacific margin of Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.193-197, 29 refs.

Three stratigraphic patterns are recognizable in the Devonian of Antarctica: (1) Early Devonian shallow-marine basins which developed on the consolidated continental crust of East Antarctica are represented in most parts of the Transantarctic Mountains by flat-lying Devonian Beacon Supergroup sedimentary rocks. Trimming of a low-relief landscape during an Early Devonian marine transgression probably produced the Kukri Erosion Surface, upon which the clastic sequence was deposited unconformably; (2) Middle-Late Devonian magmatic arc rocks occur in Marie Byrd Land and northern Victoria Land. Both regions are characterized by late Devonian I-type granitoids which cut Cambrian-Ordovician siliceous flysch. Comparisons with Australasia suggest that the antarctic magmatic arc lay in the same orogenic belt as New Zealand and eastern Australia; (3) the Ellsworth Mountains represent a region of strong crustal subsidence during the Early Palaeozoic, with the accumulation of a thick, apparently conformable sequence of shallow-water sedimentary rocks in a marginal basin setting. A shelly Devonian fauna from the Crashsite Quartzite suggests a connection with the Ohio-Pensacola shallow sea to the south. (Auth.)

E-44092

Collinson, J.W., **Palaeo-Pacific margin as seen from East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.199-204, 26 refs.

Indirect evidence of the nature of source terranes and tectonism along the palaeo-Pacific margin of Antarctica is found in the Upper Carboniferous-Triassic sedimentary sequence of the Transantarctic and Ellsworth Mountains. Four stratigraphic basins are recognized: Ellsworth Mountains, central Transantarctic Mountains, southern Victoria Land, and northern Victoria Land. Several lines of evidence suggest that these basins were components of a larger foreland basin that bordered the East Antarctic craton. The oldest volcanoclastic sediment in the foreland basin suggests that subduction and associated calc-alkaline volcanism began by Early Permian time. The earliest evidence of foreland folding and thrusting is mid-Permian, when a large prism of volcanoclastic sediment from West Antarctica reached the central Transantarctic Mountains basin. (Auth.)

E-44093

Miller, J.M.G., Waugh, B.J., **Permo-Carboniferous glacial sedimentation in the central Transantarctic Mountains and its palaeotectonic implications (Extended abstract)**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.205-208, 20 refs.

The Pagoda Formation records terrestrial glacial deposition in the Beardmore glacier area of the Transantarctic Mountains during Permo-Carboniferous time. The formation is part of an elongate outcrop belt of coeval glaciogenic rocks which trends subparallel to the inferred palaeo-Pacific margin of Antarctica. This paper outlines sedimentological data from the Pagoda Formation which are relevant to the palaeotectonic setting of the central Transantarctic Mountains during Permo-Carboniferous time. In particular it pertains to the proximity of this region to the palaeo-Pacific margin of the East Antarctic sector of Gondwana. Glaciogenic beds form the base of the Victoria Group. In the central Transantarctic Mountains, Permo-Triassic units of the upper Victoria Group were deposited on the

cratonic side of a back-arc or foreland basin which lay behind a calc-alkaline volcanic arc. (Auth.)

E-44094

Krissek, L.A., Horner, T.C., **Clay mineralogy and provenance of fine-grained Permian clastics, central Transantarctic Mountains**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.209-213, 17 refs.

In this study, the palaeoclimatic record of the (?)Upper Carboniferous-Permian sequence of the central Transantarctic Mountains is evaluated using clay mineral and bulk geochemical data from its fine-grained facies, and a palaeoenvironmental transition is recognized. Least altered samples were selected using criteria based on clay mineral presence/absence and relative abundance, and on illite order/disorder parameters. The regional compositional patterns of least-altered samples indicate that provenance evolved as follows: 1) Pagoda Formation sediments throughout the study area were derived from sources dominated by physical weathering, 2) Mackellar Formation sediments in the northern portion of the study area were derived from chemically-weathered sources, while the southern portion of the Mackellar was dominated by physically-weathered detritus, 3) Fairchild Formation sources provided a mixture of physically- and chemically-weathered material, but the exact nature and geographic position of the sources is poorly constrained by these data, and 4) Buckley Formation sediments throughout the study area were derived from sources dominated by chemical weathering, and the clay minerals may also record the onset of volcanic input to the region. Limited geochemical data support this pattern of provenance evolution in space and time. (Auth. mod.)

E-44095

Isbell, J.L., **Evidence for a low-gradient alluvial fan from the palaeo-Pacific margin in the Upper Permian Buckley Formation, Beardmore Glacier area, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.215-217, 9 refs.

In the central Transantarctic Mountains, fluvial sediments of the Permian Fairchild (230 m thick) and Buckley (750 m thick) formations were deposited in an elongate basin that paralleled the margin of the East Antarctic craton. Lower Permian palaeocurrents indicate southerly flow with deposition occurring along the axis of the basin. During the Late Permian, a thick prism of volcanoclastic sand prograded as a humid, low-gradient, alluvial fan into the basin from the palaeo-Pacific margin. Fan progradation resulted in a reversal of regional palaeoslope. (Auth.)

E-44096

Frisch, R.S., Miller, M.F., **Provenance and tectonic implications of sandstones within the Permian Mackellar Formation, Beacon Supergroup of East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.219-223, 28 refs.

The Mackellar Formation of the Beardmore Glacier region is comprised of interbedded black shales and fine sandstones, and is lithostratigraphically equivalent to other post-glacial units exposed elsewhere in the Transantarctic and Ellsworth Mountains. It was deposited by southward prograding deltaic lobes during the initial infill of a post-glacial starved basin. The inferred tectonic setting is

an elongate foreland basin behind a volcanic arc on the palaeo-Pacific margin of East Antarctica. Framework mineralogy of sandstones from the Mackellar Formation indicates a primarily continental block provenance. The probable sources are the granites and metamorphic rocks exposed to the north of the Beardmore area; this is consistent with both petrological and sedimentological data. The Polarstar Formation of the Ellsworth Mountains is stratigraphically equivalent and lithologically similar to the Mackellar Formation. However, it is thicker and has marine trace fossils and volcanic detritus; both of these features are absent from the Mackellar Formation. Closer proximity to the volcanic arc, as suggested by palaeogeographical reconstructions, would account for these differences. (Auth.)

E-44102

Funaki, M., Yoshida, M., Matsueda, H., **Palaeomagnetic studies of Palaeozoic rocks from the Ellsworth Mountains, West Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.257-260, 10 refs.

Natural remanent magnetizations (NRMs) of 37 samples from the Ellsworth Mountains were investigated palaeomagnetically. The NRM directions of sedimentary rocks form two low-latitude clusters, after tilt corrections of the strata; these samples were magnetized early (pre-folding) in their Cambrian history. The NRM directions from dykes of Cambrian and Ordovician age form a cluster without tilt corrections. The inclinations of magnetite-bearing dykes changed from steep to flat during thermal demagnetization, but samples containing haematite grains show widely scattered NRM directions. The relatively high inclinations were probably acquired during the Mesozoic. The virtual geomagnetic pole (VGP) positions obtained from sedimentary rocks are displaced 21 deg eastward and 42 deg westward from the Cambro-Ordovician VGP position for East Antarctica. The Mesozoic VGP position obtained from the dykes is located 42 deg westward from the Jurassic VGP position for East Antarctica. The results indicate a possibility that in post-Jurassic times the Ellsworth Mountains were rotated 42 deg counterclockwise with respect to East Antarctica. The sense of rotation is in agreement with a previous perpendicular counterclockwise rotation model for the Ellsworth Mountains. (Auth.)

E-44103

Rooney, S.T., Blankenship, D.D., Alley, R.B., Bentley, C.R., **Seismic reflection profiling of a sediment-filled graben beneath ice stream B, West Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.261-265, 27 refs.

Multifold seismic-reflection data from ice stream B, on the Siple Coast of West Antarctica, show lithified sedimentary beds beneath the ice that dip grid northeast about 0.5 deg and are truncated in an angular unconformity near the base of the ice. The sediments have compressional-wave velocities ranging from 1.90 to 2.25 km/s and are probably late Oligocene or younger in age. The sedimentary basin beneath ice stream B is at least 1 km thick, and possibly bounded by a large normal fault. The authors speculate that these sediments fill a graben formed by rifting in the Siple Coast region. The sedimentary sequence observed beneath ice stream B is essentially identical to that observed beneath the Ross Sea, where a few meters of till rest unconformably (the Ross Sea unconformity) on a sedimentary sequence several kilometers thick. The late Oligocene and younger rocks beneath the Ross Sea have seismic velocities of about 1.7-2.5 km/s. This similarity suggests that the Ross Sea unconformity probably was created by erosion beneath a grounded ice sheet by a deform-

ing till, and that the sediment beneath ice stream B is probably of glacial-marine origin similar to that filling the grabens of the Ross embayment. (Auth.)

E-44105

Tessensohn, F., Wörner, G., **Ross Sea rift system, Antarctica: structure, evolution and analogues**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.273-277, 28 refs.

Based on the combination of available geological and geophysical information, it is concluded that the Ross Sea depression is a major continental rift system comparable to other important rift provinces in size, morphology, structure and magmatism. It shows a two-phase evolution: a first phase related to the Australia-Antarctica separation at around 95 Ma was amagmatic and characterized by diffuse crustal attenuation (Basin & Range-type crustal thinning). A second phase commenced at about 50 Ma and caused more focussed basin subsidence, shoulder uplift and rift-type magmatism from 25 Ma to the present. This second phase resembles the development of the East African rift system. (Auth.)

E-44108

Ford, A.B., **Chemical characteristics of greywacke and palaeosol of early Oligocene or older sedimentary breccia, Ross Sea DSDP Site 270**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.293-297, 23 refs.

A 25 m thick greywacke-bearing sedimentary breccia unconformably overlies early (?) Palaeozoic metamorphic rocks and underlies Oligocene (26 Ma) greensand at DSDP Site 270, Ross Sea. Calcareous greywacke forms the breccia matrix and sandy intervals. A 3 m thick highly altered zone at the top of the breccia is an apparent palaeosol. Greywacke below the zone has an SiO₂ content of typical quartz-poor greywacke, and an unusually high CaO content reflecting a local marble-bearing source. Chemical concentration ratios show strong (Co) or minor (Ni, B, Al₂O₃) apparent gain in the palaeosol and strong (CaO, CO₂, MnO, FeO) or minor loss (P₂O₅, MgO, Rb, Sr). Variations suggest non-arid climate weathering and leaching. The palaeosol, which largely represents the parent greywacke minus original carbonate, has an SiO₂ content typical of quartz-rich greywacke of passive margin and rift settings and similar to greywacke of some Transantarctic Mountains units. The breccia was possibly deposited during Cretaceous or Palaeogene Gondwana rifting or early Transantarctic Mountains uplift and Ross Sea graben development, but it may be older. (Auth.)

E-44110

Kalamarides, R.I., Berg, J.H., **Geochemistry and tectonic implications of lower-crustal granulites included in Cenozoic volcanic rocks of southern Victoria Land**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.305-310, 18 refs.

Inclusions of lower-crustal granulites have been collected from Cenozoic volcanic rocks that have perforated the crust on both sides of the boundary between the uplifted Transantarctic Mountains (TM) and the lowlying Ross embayment (RE). Major and trace element analyses of these granulites indicate that the RE lower crust is dominated by cumulates from basic melts of transitional or alkaline affinity. In contrast, the TM lower crust is dominated by basic-melt (or near-melt) compositions having a clearly calc-alkaline affinity. The TM

and RE granulites plot in well separated fields on a $\delta^{18}\text{O}$ -Isr diagram and are also dissimilar to the Jurassic Ferrar magmatism. Correlations between isotopic values and element concentrations as well as inter-element correlations are clearly evident in the TM granulite suite, but are weak or absent within the RE granulite suite. These results strongly indicate that the composition of the lower crust under the Transantarctic Mountains is quite different from that under the Ross embayment. Because of the striking differences in the nature of the lower crusts, the current faulting and rifting associated with this topographic boundary apparently coincide with an ancient crustal suture. (Auth.)

E-44112

McGibbon, F.M., **Geochemistry and petrology of ultramafic xenoliths of the Erebus volcanic province**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.317-321, 16 refs.

The ultramafic xenoliths of the Erebus volcanic province can be subdivided into three main groups on the basis of mineral chemistry: (1) spinel lherzolite with Mg- and Cr-rich diopside; (2) augitic clinopyroxenites and Fe- and Ti-rich clinopyroxenes; and (3) fassaitic clinopyroxenites with calcic clinopyroxenes. Whole-rock major, trace, and isotopic chemistry demonstrates that spinel lherzolites are mantle residua whereas the augitic clinopyroxenites represent cumulates from asthenospheric, silica-undersaturated liquids similar to their host basanites. The fassaitic clinopyroxenites, however, are in marked chemical contrast to both their present host lavas and the tholeiitic magmas of the Ferrar Supergroup, to which they have been previously linked; they are interpreted as cumulates from alkalic LREE-enriched liquids which had a high initial Sr-87/Sr-86 ratio of at least 0.7080. The abundant low-Ti phlogopite in these samples is texturally secondary but was isotopically indistinguishable from the hosting clinopyroxenite at the time of its formation. These fassaitic clinopyroxenites retain a Siluro-Ordovician isochron age. Whether this represents a formation age or a metamorphic overprint (during the Ross Orogeny) cannot be resolved at present. (Auth.)

E-44113

Stern, T.A., Davey, F.J., Delisle, G., **Lithospheric flexure induced by the load of Ross Archipelago, southern Victoria Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.323-328, 25 refs.

Observations of gravity, radio echo sounding and multichannel seismic reflection are used to deduce bathymetry, ice-shelf thickness and sediment structure to the southeast of Ross I. The data are applied to a flexural analysis of the deformation induced by the superposed load of the Ross Archipelago. The best-fit model is that of a discontinuous elastic plate (the lithosphere) overlying a weak fluid (the asthenosphere). A maximum deflection of about 1800 m is inferred to occur beneath the Ross Archipelago and a compensating outer flexural bulge of about 100 m, at a distance of about 200 km from the center of the Ross Archipelago, is also predicted. A flexural rigidity of about 10(23) N.m is estimated for the lithosphere underlying the Ross Archipelago. This value for rigidity is low for 500 Ma old lithosphere, and it suggests that the lithosphere within the Ross embayment has been thermally reactivated in the Cenozoic. (Auth.)

E-44114

Kaminuma, K., Shibuya, K., **Structure and seismic activity of Mount Erebus, Ross Island**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.329-333, 11 refs.

Mount Erebus, an active volcano on Ross I., began its present continuously eruptive phase in 1972; it was monitored seismically from Dec. 1980 until Dec. 1986. From Dec. 1980 to Aug. 1984 the number of seismic events around Mount Erebus averaged 20-150/d, including several earthquake swarms. A change in the volcanic activity, between Sep. 13-Dec. 31, 1984, was accompanied by a distinct decrease in the intensity of background seismicity, and only a few earthquakes were recorded subsequently. The number of seismic events during 1985 and 1986 averaged 10-20/d, with one and two earthquake swarms, respectively, for those years. Seven shots were detonated at four sites on Mount Erebus during Nov. and Dec. 1984. The P-wave velocity of the top layer in the Mount Erebus area is 3.07 km/s with a thickness of 2.2-2.4 km; those of the second and third layers are 4.67 and 6.27 km/s, respectively. The depth of the boundary between the second and third layers is 6.6 km from the summit. (Auth.)

E-44115

Milne, A.J., Millar, I.L., **Mid-Palaeozoic basement in eastern Graham Land and its relation to the Pacific margin of Gondwana**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.335-340, 31 refs.

Geochronological study of the orthogneissic country rock to the Mesozoic magmatic arc of Graham Land confirms for the first time the presence of a mid-Palaeozoic basement. Rb-Sr data on whole-rock samples of the orthogneiss indicate a Silurian origin involving little crustal contribution. Sm-Nd studies on garnet-whole-rock pairs indicate that subsequent amphibolite-facies metamorphism occurred during the Late Carboniferous. The extent of this basement is unknown but it may well underlie much of the Antarctic Peninsula. In mid-Palaeozoic time Graham Land may have been attached to the Pacific margin of Gondwana, and this plutonic event may be correlated with subduction-related intrusive activity elsewhere along Gondwana's Pacific margin. (Auth.)

E-44116

Harrison, S.M., Piercy, B.A., **Basement gneisses in north-western Palmer Land: further evidence for pre-Mesozoic rocks in Lesser Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.341-344, 6 refs.

Within northwestern Palmer Land, orthogneiss, metapelite, marble and associated calc-silicate gneiss and granulite form the basement to the rocks of the Mesozoic magmatic arc. The orthogneiss represents I-type calc-alkaline granitoids and is chemically very similar to the Mesozoic granitoids. Two Rb-Sr whole-rock isochrons indicate that the age of the original igneous crystallization of the orthogneiss was approximately 400-440 Ma. The calc-alkaline nature of the rock suggests that it is a product of subduction-related plutonism, and it is likely that northwestern Palmer Land represented a part of the Pacific margin of Gondwana during the mid-Palaeozoic. Age constraints on the paragneiss and granulite are limited, but they must be of Triassic or pre-Mesozoic age since they were metamorphosed, together with the orthogneiss, to high grade amphibolite facies at approximately 200 ma. These rocks could represent either subduction/accretion materi-

al similar to some components of the Scotia metamorphic complex, or more likely, correlatives of the Lower Palaeozoic sedimentary sequence that is exposed intermittently along the Transantarctic Mountains on the western edge of Greater Antarctica. (Auth.)

E-44117

Weaver, S.D., Bradshaw, J.D., Adams, C.J., **Granitoids of the Ford Ranges, Marie Byrd Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.345-351, 19 refs.

In the Ford Ranges, Swanson Formation sedimentary rocks are cut by the Late Palaeozoic Ford Granodiorite and Mesozoic Byrd Coast Granite. The Ford Granodiorite is a granodiorite-monzogranite suite of biotite-rich, hornblende-bearing rocks of 350-380 Ma age. The suite is calc-alkaline, metaluminous to peraluminous, with initial Sr-87/Sr-86 of 0.704-0.706, features characteristic of I-type granitoids. Trace-element tectonic discriminants suggest that the Ford Granodiorite represents magmas emplaced in either an active continental margin or post-tectonic environment. Petrologically, the Ford Granodiorite matches the southern Admiralty Intrusives of northern Victoria Land. Marie Byrd Land, the Robertson Bay and Bowers terranes of northern Victoria Land, the Campbell Plateau and the Western Province of New Zealand are part of an extensive continental mass which accreted to the Gondwana margin during the Late Palaeozoic. The Byrd Coast Granite is typically biotite-bearing leucogranite and may have been emplaced as two pulses at about 140 Ma and 110 Ma. The suite is calc-alkaline, mostly peraluminous and has initial Sr-87/Sr-86 of 0.704-0.708. Trace element geochemistry designates granitoids of the Clark Mountains and Mount McClung as anorogenic A-types. At least these components of the Byrd Coast Granite may not be strictly part of the subduction-related Mesozoic magmatic arc of West Antarctica. (Auth.)

E-44118

Tanner, P.W.G., **Turbidite sequences on South Georgia, South Atlantic: their structural relationship and provenance**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.353-359, 13 refs.

Two major turbidite sequences, the Cumberland Bay (CBF) and Sandebugten Formations (SF), occupy the South Georgia portion of the southern Andes back-arc basin. Structural mapping around Cumberland East Bay shows that the two formations are separated by the Dartmouth Point Thrust. Contrary to some previous interpretations, the early (D1) structures on either side of the thrust cannot be correlated. True scale down-plunge profiles drawn using computed means of structural data show that the folds above the thrust verge NE and the thrust cuts up-section in that direction in the CBF. These folds probably developed broadly contemporaneously with the thrust movement, whereas tight chevron folds in the footwall (SF) are cut at a high angle by the thrust plane and relate to an earlier phase of deformation. 90 whole-rock analyses of coarse-grained sandstones from the CBF (including the Barff Point Member-BPM) and SF, when plotted on geochemical discrimination diagrams, substantiate previous conclusions from petrographic studies that the CBF was derived from an andesitic island-arc source, the SF from a continental magmatic arc, and that the BPM is of mixed provenance. One model consistent with both geochemical and structural data is that the basin underwent an early closure event during which the SF was deformed, and a final closure during which the CGF was deformed and thrust over the SF. Alternatively, the SF may be of Palaeozoic or early Mesozoic age and was deformed prior to the opening of the back-arc basin. (Auth.)

E-44119

Barber, P.L., Barker, P.F., Pankhurst, R.J., **Dredged rocks from Powell Basin and the South Orkney microcontinent**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.361-367, 44 refs.

The results of geochemical analyses and isotopic determinations on dredged rocks from around Powell Basin and on the South Orkney microcontinental block are reported. Among the *in situ* rocks are two main groups: a calc-alkaline suite of Late Cretaceous age, and an alkali-basaltic suite of Pliocene-Recent age with an additional, possibly related Eocene occurrence. The calc-alkaline rocks reinforce earlier interpretations that the main magnetic province on the South Orkney block is an extension of the Antarctic Peninsula magmatic arc, produced by subduction of Pacific oceanic lithosphere. The alkaline rocks are very similar to those exposed elsewhere along the Antarctic Peninsula, e.g. Alexander I., Seal Nunataks, James Ross I., *inter al.* The extension of the geographical range of this suite emphasizes the enigmatic nature of its relationship with subduction at the Pacific margin. The Eocene alkali basalts may be precursors to the Powell Basin opening. (Auth.)

E-44124

Mougenot, D., **Mozambique Ridge (Indian Ocean): a continental fragment shaped during the transform motion of American and Antarctic plates along East Africa?** [La ride du Mozambique (Océan Indien): un fragment continental individualisé lors du coulisement de l'Amérique et de l'Antarctique le long de l'Afrique de l'Est], *Académie de sciences, Paris. Comptes rendus. Série II*, March 14, 1991 312(6), p.655-662, In French with English summary. 23 refs.

The Mozambique Ridge consists of a north-south trending alignment of large submarine plateaux lying parallel to the southeast coast of Africa. During a recent cruise (MD 60/MACAMO, Feb. 1989) 3,600 km of seismic reflection lines and 3 dredge hauls were collected. Precambrian metamorphic rocks (granite, gneiss or schist) and tholeiitic basalts of Karroo affinity were dredged, indicating that the Mozambique Ridge might be a continental fragment of Africa. In early Cretaceous times, the ridge was segmented by transverse half-grabens that were active during the transform motion of Antarctica and South America along the Mozambique Fracture Zone. (Auth.)

E-44133

Klein, J., Fink, D., Middleton, R., Nishiizumi, K., Arnold, J., **Determination of the half-life of Ca-41 from measurements of antarctic meteorites**, *Earth and planetary science letters*, Apr. 1991 103(1/4), p.79-83, 20 refs.

Using accelerator mass spectrometry (AMS), the half-life of Ca-41 was determined from the decrease of its concentration with terrestrial age in 5 antarctic meteorites and a recent fall. The meteorites were selected on the basis of their Cl-36 concentrations (measured on the same aliquots as used here), which showed a span of terrestrial ages of about 600 ka, and on the basis of other cosmogenic-nuclide concentrations which indicated that the meteorites had small pre-atmospheric sizes (so that the samples were negligibly shielded from primary cosmic rays), and sufficiently long irradiation times in space that the concentrations of Ca-41 and Cl-36 were in secular equilibrium prior to the meteorites' fall to Earth. Based on the decrease of Ca-41 relative to Cl-36 ($t_{1/2} = 301$ ka), it is inferred that the half-life of Ca-41 is 103 ka. (Auth.)

E-44138

Greenfield, L.G., **Fixed ammonium in antarctic rocks and soils and a possible cause of underestimation**, *Soil biology and biochemistry*, 1991 23(4), p.397-399, 11 refs.

Greenfield (1988) described the occurrence of fixed NH₄ in antarctic rocks and Greenfield and Wilson (1981) of fixed NH₄ in antarctic soils. These earlier findings are confirmed and extended to other continental and maritime antarctic locations. The possibility that grinding caused the release of fixed NH₄ is examined. Results demonstrate that NH₄ occurs in a variety of rocks and soils in Antarctica in amounts and proportions similar to those elsewhere in the world.

E-44141

Truswell, E.M., ed, Owen, J.A.K., ed, International Palynological Congress, 7th, Brisbane, Qld., Aug. 29-Sep. 3, 1988, **Proceedings of the 7th International Palynological Congress**, Amsterdam, Elsevier, 1990, 391p., Reprinted from Review of paleobotany and palynology, volumes 64 and 65. Refs. passim. For selected papers see E-44142 through E-44144.

DLC QE993.I57

The 7th International Palynological Congress was held in Brisbane from Aug. 29 to Sep. 3, 1988. These two volumes comprise 81 of a total of 335 papers presented. Quaternary palynology is strongly represented in the articles included, 3 of which are pertinent to Antarctica.

E-44142

Askin, R.A., **Campanian to Paleocene spore and pollen assemblages of Seymour Island, Antarctica**, International Palynological Congress, 7th. Proceedings. Edited by E.M. Truswell and J.A.K. Owen, Amsterdam, Elsevier, 1990, p.105-113, Reprinted from Review of paleobotany and palynology, Vol.65. Refs. p.112-113.

DLC QE993.I57

Spore and pollen assemblages in Campanian to Paleocene near-shore marine to deltaic sediments of Seymour I. are characterized by abundant podocarpaceous conifer pollen, diverse provincial angiosperm pollen, and cryptogam spores of low diversity. These assemblages resemble coeval assemblages from New Zealand, eastern Australia and southern South America. The palynoflora reflects primarily conifer-dominated rainforest growing in cool to warm temperate paleoclimates. The late Maastrichtian was a comparatively warm interval, with a humid equable paleoclimate. The Antarctic Peninsula cordillera probably supported altitudinally zoned plant associations and it is likely that climatic fluctuations during the Campanian to Paleocene resulted in altitudinal shifts of these vegetation zones. (Auth.)

E-44143

Dettmann, M.E., Jarzen, D.M., **Antarctic/Australian rift valley: Late Cretaceous cradle of northeastern Australasian relicts?**, International Palynological Congress, 7th. Proceedings. Edited by E.M. Truswell and J.A.K. Owen, Amsterdam, Elsevier, 1990, p.131-144, Reprinted from Review of paleobotany and palynology, Vol.65. Refs. p.143-144.

DLC QE993.I57

The montane vegetation of northeastern Australasia represents a modified sample of the Late Cretaceous flora that fringed the embryonic southern ocean in the southern Australasian/Antarctic region. *Beauprea*, *Knightia*, *Macadamia*, *Gevuina* and/or *Hicksbeachia* (Proteaceae), *Gunnera* (Gunneraceae), *Ilex* (Aquifoliaceae), Winteraceae, Epacridaceae, trimeniaceae, *Nothofagus* (*brassii* group), Araucariaceae, *Podocarpus*, *Dacrydium* and *Dacrycarpus* (Podocarpaceae) are confirmed in the Campanian-Maastrichtian pollen record

of estuarine sediments in the Otway Basin, southeastern Australia. The primitive angiosperms migrated there by individualistic routes after Early Cretaceous appearances in northern Gondwana and southern Laurasia; other taxa evolved in austral regions. Evidence is advanced for origin of *Ilex*, *Beauprea*, *knightia* and *Gevuina/Hicksbeachia* in southern Australia/Antarctica during early phases (Late Cretaceous) of opening of the southern ocean. (Auth.)

E-44144

Farabee, M.J., Taylor, E.L., Taylor, T.N., **Correlation of Permian and Triassic palynomorph assemblages from the central Transantarctic Mountains, Antarctica**, International Palynological Congress, 7th. Proceedings. Edited by E.M. Truswell and J.A.K. Owen, Amsterdam, Elsevier, 1990, p.257-265, Reprinted from Review of paleobotany and palynology, Vol.65. 32 refs.

DLC QE993.I57

Palynological studies of terrestrially derived sediments in Antarctica are especially valuable in deciphering geological questions of age, correlation, and paleoenvironments. Palynomorphs are summarized here, recovered from Buckley Formation outcrops in the central Transantarctic Mountains. Palynoassemblages from the overlying Fremouw and Falla Formations (Triassic) were also examined. The Buckley assemblages are interpreted as Late Permian (Australian Stage 5). Silicified peat from the Fremouw Formation (Early-Middle Triassic) yielded an assemblage indicating a possible Anisian age (Middle Triassic). Shales and shaley coals from the Falla Formation (Late Triassic) contained assemblages correlative with possible Norian (Late Triassic) sequences in Australia and Tasmania. Permian-Triassic palynofloras in Antarctica show greater similarity with Australian assemblages than with those from other Gondwana continents. (Auth.)

E-44156

Hoffman, P.F., **Did the breakout of Laurentia turn Gondwanaland inside-out**, *Science*, June 7, 1991 252(5011), p.1409-1412, Numerous refs.

Comparative geology suggests that the continents adjacent to northern, western, southern, and eastern Laurentia in the Late Proterozoic were Siberia, Australia-Antarctica, southern Africa, and Amazonia-Baltica, respectively. Late Proterozoic fragmentation of the supercontinent centered on Laurentia would then have been followed by rapid fan-like collapse of the (present) southern continents and eventual consolidation of East and West Gondwanaland. In this scenario, a pole of rotation near the Weddell Sea would explain the observed dominance of wrench tectonics in (present) east-west trending Pan-African mobile belts and subduction-accretion tectonics in north-south trending belts. In the process of fragmentation, rifts originating in the interior of the Late Proterozoic supercontinent became the external margins of Paleozoic Gondwanaland; exterior margins of the Late Proterozoic supercontinent became landlocked within the interior of Gondwanaland. (Auth.)

E-44160

Dalziel, I.W.D., **Pacific margins of Laurentia and East Antarctica-Australia as a conjugate rift pair: evidence and implications for an Eocambrian supercontinent**, *Geology*, June 1991 19(6), p.598-601, 40 refs.

In Laurentian and East Antarctica-Australia cratons both margins extend for approximately 40 deg of latitude. They have a similar rift history throughout their length—i.e., Late Proterozoic rifting and Early Cambrian carbonate platform development. A geometrically acceptable computer-generated reconstruction for the latest Precambrian juxtaposes and aligns the Grenville front that is truncated at the Pacific margin of Laurentia and a closely comparable tectonic boundary in East Antarctica that is truncated along the Weddell Sea margin. These may prove to be critical, perhaps even unique, “piercing points” for relating the northern and southern continents. Geologic and

paleomagnetic evidence also suggests that the Atlantic margin of Laurentia rifted from the proto-Andean margin of South America in earliest Cambrian time. Early Phanerozoic sea-floor spreading that isolated Laurentia from South America and East Antarctica-Australia in an Eocambrian supercontinent appears to balance convergence along the Mozambique suture which resulted in final amalgamation of the smaller Gondwana supercontinent at about 500 Ma. (Auth.)

E-44163

Gradusov, B.P., Cherniakhovskii, A.G., Chizhikova, N.P., **Ecological soil petrography and mineralogy** [Ekologicheskaya petrografiya i mineralogiya pochv], Problemy pochvovedeniya v Sibiri; sbornik nauchnykh trudov (Problems of soil science in Siberia; collected scientific papers). Edited by I.M. Gadzhiev, Novosibirsk, Nauka, 1990, p.13-34, In Russian. 15 refs.

Introducing a concept of ecological petrography and mineralogy, this paper covers the influence of phase composition, the crystal-chemistry of rock-forming minerals, mixed layer formations on characteristic features, and the composition, structure, and functions of main soil components. The tables included provide data for the ecosystems of arctic and antarctic deserts and tundra, taigas, deciduous boreal forests, steppes, and arid thin forests. (Auth. mod.)

E-44170

Hole, M.J., Pankhurst, R.J., Saunders, A.D., **Geochemical evolution of the Antarctic Peninsula magmatic arc: the importance of mantle-crust interactions during granitoid genesis**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.369-374, 12 refs.

Four distinct groups of subduction-related intrusive rocks have been identified within Graham Land, northern Antarctic Peninsula. Sr- and Nd-isotope characteristics are given along with their age ranges and general locations in Graham Land. The temporal and spatial variations in isotopic and trace element characteristics of these plutons are best explained by variable degrees of magma-crust interaction within the arc. The proportion of crustal material involved in magmagenesis increases from Group I to Group IV. Along-arc variations in crustal thickness have resulted in variable degrees of mantle-crust interaction both in space and time. However, variations in Nb/Y ratios throughout the arc may reflect a degree of heterogeneity within the subcontinental lithosphere beneath Graham Land. (Auth. mod.)

E-44171

Moyes, A.B., **Variation in amphibole composition from the Andean Intrusive Suite across the Antarctic Peninsula**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.375-379, 12 refs.

Amphibole is a common constituent throughout the entire suite of Mesozoic-Cenozoic subduction-related calc-alkaline plutonic rocks of the Antarctic Peninsula, referred to as the Andean Intrusive Suite. Microprobe data on 51 samples, covering the range from gabbro to monzogranite, indicate that all the amphibole is calcic and that the compositional variation is dominated by the Ti-tschermakite and edenite substitutions. Intercumulus, poikilitic brown or greenish-brown amphibole in gabbroic rocks is tschermakite (Al- and Ti-rich), whereas euhedral or subhedral olive-green or greenish-blue amphibole in intermediate and granitic rocks is more Si-rich magnesio- or ferrohornblende. This variation results from higher temperatures and pressures during amphibole crystallization in the more mafic rocks. The Mg/(Mg + Fe²⁺) ratio (Mg*) varies regionally in that ferrohornblende (Mg*0.5) does not occur in samples closest to the trench,

but becomes common farther from the subduction site. This variation in Mg* is independent of host rock compositional control, and correlates with a change in the opaque phase from magnetite to ilmenite, resulting from lower fO₂ conditions during crystallization with increasing distance from the trench. (Auth.)

E-44172

Piercy, B.A., Harrison, S.M., **Mesozoic metamorphism, deformation and plutonism in the southern Antarctic Peninsula: evidence from north-western Palmer Land**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.381-385, 16 refs.

Studies within the magmatic arc of Palmer Land have identified several suites of plutonic rocks, of both pre-Mesozoic and Mesozoic age, in various deformation states. An undeformed plutonic suite, of Jurassic-Cretaceous age, corresponds to the Andean Intrusive Suite of Graham Land. This diorite-granite sequence intrudes all the other rock groups. More evolved rocks form small, high level, granophyric stocks. Deformed rocks range from weakly foliated plutons to orthogneisses and migmatites. These rocks, along with porphyroclastic mylonites and boudinaged amphibolite sheets, were produced by recrystallization and heterogeneous deformation in ductile shear zones. Metamorphosed sedimentary rocks form paragneisses which contain minerals whose parageneses indicate high temperature and moderate pressure metamorphic conditions. In terms of arc evolution this suggests that pre-Mesozoic crustal materials were regionally metamorphosed and deformed contemporaneously with magmatism in the Early Jurassic. Basic magmatism at that time drove the metamorphism, and produced the deformation recorded in the gneisses. These events may correspond with the break-up of the Pacific margin of Gondwana. (Auth.)

E-44173

Pankhurst, R.J., Rowley, P.D., **Rb-Sr study of Cretaceous plutons from southern Antarctic Peninsula and eastern Ellsworth Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.387-394, 18 refs.

Calc-alkaline plutons of the Early Cretaceous Lassiter Coast Intrusive Suite are abundant in the southeastern Antarctic Peninsula and in eastern Ellsworth Land. They intrude the folded products of a Jurassic magmatic arc. The plutonic rocks, ranging in composition from gabbro to granite, are typical circum-Pacific (Andean) granitoids. New Rb-Sr mineral and whole-rock age determinations for 10 of the plutons range from 128 to 96 ma, in excellent agreement with previous K-Ar dates. They indicate rapid cooling. The emplacement episode was relatively short, whereas plutonism in the northern Antarctic Peninsula spanned a period from Late Triassic to Tertiary time. Initial Sr-87/Sr-86 ratios for about 50 whole-rock samples from 14 plutons are relatively low, indicating that remelting of ancient upper crust was not an important petrogenetic factor. Unlike most comparable plutonic rocks of northern Antarctic Peninsula, those of the Lassiter Coast Intrusive Suite exhibit primary isotopic heterogeneity, interpreted as indicating significant crustal contamination during emplacement through thick but isotopically juvenile continental crust. (Auth.)

E-44175

Storey, B.C., Pankhurst, R.J., Millar, I.L., Dalziel, I.W.D., Grunow, A.M., **New look at the geology of Thurston Island**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.399-403, 22 refs.

The regional geology of the Thurston Island-Eights Coast crustal block (TI) is re-assessed using recent field and laboratory data. It is clearly established as part of the Pacific active margin of Gondwana throughout Late Palaeozoic-Mesozoic times, with no direct relationship to East Antarctic cratonic evolution. The oldest rocks exposed are high-Sr granodioritic orthogneisses at Morgan Inlet, which are Carboniferous in age. The younger history of Thurston I. is dominated by the development of Mesozoic igneous rocks. Upper Jurassic-Lower Cretaceous calc-alkaline granitoids occupy most of the southern and western parts of the island, although some granites have characteristics of tholeiitic differentiates. The northern and eastern parts are composed of a coarse-grained pyroxene-gabbro suite associated with a linear magnetic anomaly. An age of 122 Ma for a complex of fine-grained gabbros and aplite dykes near Belknap Nunatak implies a minimum age of Early Cretaceous. The center of the island is capped by a sequence of hydrothermally-altered volcanic rocks and associated pyroclastics. An east-west dyke swarm intrudes the plutonic and volcanic rocks. (Auth. mod.)

E-44177

Smellie, J.L., **Stratigraphy, provenance and tectonic setting of (?)Late Palaeozoic-Triassic sedimentary sequences in northern Graham Land and South Scotia Ridge**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.411-417, 25 refs.

The (?)Permo-Triassic Trinity Peninsula Group, Miers Bluff Formation and Greywacke-Shale Formation are amongst the oldest rocks known in northern Graham Land and South Scotia Ridge. They contain at least three distinctive sandstone petrofacies. Stratigraphical, structural and metamorphic considerations suggest the possibility of a crude regional stratigraphy. The main phase of deformation comprises gently plunging, large-scale isoclines with NW-dipping axial surfaces and south-easterly vergence. Regional metamorphism ranged from prehnite-pumpellyite to greenschist-facies, and was probably of medium-pressure type. Four textural zones are recognized, with a broad distribution pattern consistent with strong structural-stratigraphical control. The tectonic setting of these sequences is equivocal. The majority of the detrital modes indicate derivation from a major continental margin magmatic arc, although its location and active-inactive state remain unclear. The dominant SE-verging (i.e. 'arcward') large-scale structures and the presence of interbedded and intrusive volcanic rocks with alkaline compositions are clearly anomalous in any fore-arc model, but can be accommodated in a sedimentary basin located behind an arc. There is still no unambiguous evidence for the timing of the initiation of subduction in this part of the Pacific margin of Gondwana. (Auth.)

E-44178

Wilson, T.J., Grunow, A.M., Hanson, R.E., Schmitt, K.R., **Subduction-complex rocks on Diego Ramirez Islands, Chile**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.419-421, 12 refs.

Recent mapping of the Diego Ramirez Is., southernmost Chile, has shown that the islands consist of tectonic *mélange* structurally interleaved with portions of a dismembered and metamorphosed basaltic seamount. Crossite is present in the metabasalts, indicating

comparatively high $-P$ -low- T metamorphism. The rocks show evidence of a prolonged, polyphase structural history, including several generations of ductile and brittle structures that are interpreted to be the products of deformation, tectonic mixing, and *mélange* formation at different levels in a subduction complex. The Diego Ramirez Is. thus form part of the fore-arc accretionary complex developed along the Pacific margin of Gondwana, and provide a link between the Palaeozoic-Mesozoic subduction-complex rocks exposed along the coast of central and southern Chile, and the Scotia metamorphic complex of the Antarctic Peninsula region. (Auth.)

E-44179

Trouw, R.A.J., Ribeiro, A., Paciullo, F.V.P., **Structural and metamorphic evolution of the Elephant Island group and Smith Island, South Shetland Islands**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.423-428, 13 refs.

Three distinct metamorphic zones were identified on Elephant I.: a low-grade chlorite zone with pumpellyite, a garnet zone with blue amphibole, and biotite zone, with garnet, hornblende and albite. Contrary to the concept of a major tectonic break, separating north from south Elephant I., the gradual changes between these zones suggest one prograde sequence of subduction-associated metamorphism of Sanbagawa-type. Clarence I. is comparable to the chlorite zone and Smith I. to the garnet zone. Three deformational phases affected the complex: D1, D2 and D3. D1 is responsible for a penetrative cleavage, an elongation lineation and tight folds. Syntectonic snowball garnets, local sheath folds and highly elongated volcanic fragments indicate strong shear movements during this phase, which is tentatively correlated with subduction, due to the presence of syntectonic blue amphibole. D2 resulted in folding with southward vergence and was probably related to southward ductile overthrusting, accompanied by the growth of lower pressure/temperature (P/T) minerals. Post-metamorphic D3 structures, mainly open folds and kinks with variable orientations, are attributed to isostatic uplift and denudation. Sedimentary rocks, mainly siltstones and conglomerates, have been discovered on the Seal Is. Radiolarians and planktonic foraminifera reveal a marine environment and a maximum age of early Miocene for these rocks. (Auth.)

E-44180

Herve, F., Loske, W., Miller, H., Pankhurst, R.J., **Chronology of provenance, deposition and metamorphism of deformed fore-arc sequences, southern Scotia arc**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.429-435, 18 refs.

The Trinity Peninsula Group (TPG) is a Permo-Carboniferous-Triassic fore-arc sequence metamorphosed to very low grade in Triassic times. The euhedral form and highly discordant U-Pb ages of most detrital zircons indicate proximal provenance from juvenile Carboniferous granitoids. Scarce pink and well-rounded zircons may reflect minor source rocks with a Precambrian history. The Scotia metamorphic complex (SMC) contains rocks from a variety of tectonic settings, stacked together and metamorphosed in a subduction-accretionary wedge. Scarce idiomorphic detrital zircons suggest a component from a Late Palaeozoic granitic source terrain similar to that of the TPG. A Rb-Sr whole-rock isochron of 287 Ma for Gibbs I. schists suggests a Late Palaeozoic metamorphism, also recorded in nearby Elephant I. epidote-amphibolite schists, where Rb-Sr whole-rock data allow a maximum protolith/provenance age of Permian. By contrast, the low-grade SMC rocks of northern Elephant I. are probably no older than Mesozoic in terms of both provenance and deposition. (Auth. mod.)

E-44181

Tranter, T.H., **Accretion and subduction processes along the Pacific margin of Gondwana, central Alexander Island**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.437-441, 25 refs.

Four tectonostratigraphic units are recognized in the LeMay Group of central Alexander I. They are interpreted as arc-derived clastic material and allochthonous volcanic rocks of oceanic origin incorporated in a subduction-accretion complex. Deformation is variable, but can mainly be related to accretionary processes acting at different levels within the complex. Metamorphic grade is generally low, but blue amphibole-bearing metabasalts indicate locally elevated P - T gradients. The accreted bodies include strata of Jurassic-Cretaceous age and suggest that correlations drawn with (?)Triassic sequences elsewhere in the Antarctic Peninsula region may not be strictly valid. The LeMay Group shows similarities with the Mesozoic accretionary fore-arc of New Zealand, and these two areas may be related. (Auth.)

E-44182

Nell, P.A.R., Storey, B.C., **Strike-slip tectonics within the Antarctic Peninsula fore-arc**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.443-448, 23 refs.

The Antarctic Peninsula was the site of magmatic arc activity associated with the eastward subduction of proto-Pacific oceanic lithosphere for much of the Mesozoic. It is composed of calc-alkaline igneous rocks, accretionary complexes, and extensive fore- and back-arc sedimentary basins. Structural data from the accretionary complex of Alexander I. suggest that transcurrent motion associated with accretionary processes may have been caused by oblique subduction. Later, long-lived strike-slip faulting may have a different cause, and affected both the accretionary complex and fore-arc basin. In the latter, its effects include NW-SE-trending, oblique folds and thrusts, faults with NW-SE extension, and contemporaneous sandstone dykes. Strike-slip motion has played an important, but previously unrecognized, control on the development of the Antarctic Peninsula fore-arc, and may have controlled the formation of sedimentary basins. (Auth.)

E-44183

Butterworth, P.J., MacDonald, D.I.M., **Basin shallowing from the Mesozoic Fossil Bluff Group of Alexander Island and its regional tectonic significance**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.449-453, 7 refs.

A 4000 m thick Kimmeridgian-Albanian fore-arc sedimentary succession crops out as a belt 250 km long x 30 km wide on the eastern coast of Alexander I. Three major units are recognized in the northern to central part of the outcrop belt: deep marine submarine fan conglomerates, slope mudstones and shallow-marine sandstones. This paper describes the sedimentology of the Lower Cretaceous slope mudstone succession which defines an overall regression from deep to shallow-marine environments. This regressive sequence implies a relative fall in sea-level from Berriasian to Albian times, which contrasts with the worldwide sea-level rise during the Early Cretaceous. This suggests that tectonism in the fore-arc region was the dominant controlling factor in basin evolution during the Early Cretaceous. Syndepositional tectonic episodes within the slope assemblage are reflected in sandstone-rich units and localized unconformities, and the

occurrence of some relatively large synsedimentary *mélange* zones. (Auth.)

E-44184

Laudon, T.S., **Petrology of sedimentary rocks from the English Coast, eastern Ellsworth Land**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.455-460, 24 refs.

The English Coast of West Antarctica contains the south-westernmost exposures of the Antarctic Peninsula tectonic province (APTP). Sedimentary rocks are assigned to three units on the basis of their possible ages, lithologies and structural attitudes. Metamorphosed quartz sandstone of unknown age and continental interior provenance, named the FitzGerald quartzite beds, was deposited in a passive margin environment, and probably represents pre-Upper Palaeozoic basement of the APTP. Stratigraphical linkage to the Devonian Crashsite Quartzite of the Ellsworth Mountains is suggested. Large clasts of quartzite petrographically similar to the FitzGerald quartzite beds occur in conglomerate of the Jurassic Latady and Mount Poster Formations in the English Coast and Orville Coast areas, suggesting widespread distribution of quartzite in the basement of the region. Magmatic arc-derived clastic rocks of Permian age, which contain *Glossopteris* flora at Erewhon Nunatak, are named the Erewhon beds. They indicate that subduction-related magmatism had begun in the English Coast by Late Palaeozoic time. Stratigraphical linkage to the Polarstar Formation of the Ellsworth Mountains is suggested. Clastic rocks of (?)Jurassic age and recycled orogenic provenance are correlated with the Latady Formation. They were deposited in terrestrial and paralic environments, with associated coeval volcanic activity. (Auth.)

E-44185

Kellogg, K.S., Rowley, P.D., **Tectonic evolution of the south-eastern Antarctic Peninsula**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.461-465, 23 refs.

The oldest exposed rocks of south-eastern Antarctic Peninsula have been recognized as part of a Middle-Late Jurassic volcanic arc which developed in response to subduction beneath the Pacific margin of the peninsula. Many of the calc-alkaline volcanic rocks which occupy the axial part of the arc (Mount Poster Formation), and the sedimentary sequence that occupies the back-arc basin to the east (Latady Formation), were intensely folded and thrust before the formation of an Early Cretaceous (mostly 113-97 Ma) calc-alkalic plutonic arc. The Early Cretaceous arc overlaps both the Jurassic volcanic arc and the back-arc basin to the east and south, a feature which may be related to relative flattening of the subducting slab under the southern peninsula during the Early Cretaceous. Most faults in the southern peninsula are small, oriented about N70W, have right-lateral apparent offset, and are probably parallel to a large, right-lateral transform (the Ellsworth fault) that forms the southern tectonic boundary of the peninsula. (Auth. mod.)

E-44186

Rowley, F.D., **Tectonic setting of the English Coast, eastern Ellsworth Land, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.467-473, 42 refs.

The English Coast is the western continuation of the Antarctic Peninsula tectonic province. Most exposed rocks belong to a folded

sequence of chloritized calc-alkalic volcanic rocks, correlated with the Mount Poster Formation, and intertongued subordinate sedimentary rocks, correlated with the Jurassic Latady Formation. Older rocks are locally exposed: the Erewhon beds of volcanogenic sandstone containing a (?)Permian *Glossopteris* flora, and the FitzGerald quartzite beds of cratonic provenance. The folded rocks were intruded by Lower Cretaceous granodiorite plutons, then overlain by Tertiary lava flows and hyaloclastite of alkalic basalt. Break-up of Gondwana involved right-lateral strike-slip displacement along the Jurassic Transantarctic Rift. One result of break-up was numerous lithospheric plates that now comprise West Antarctica. Continuing Andean-type ensialic arc magmatism along the Pacific edge of these plates resulted in the intertongued volcanic and sedimentary rocks of the English Coast. All rocks were folded during the Late Jurassic-Early Cretaceous Palmer Land event. Cretaceous plutons represent renewal of arc magmatism, which terminated with Tertiary crustal thinning and extension. (Auth. mod.)

E-44189

Li, Z., Liu, X., **Geological and geochemical evolution of Cenozoic volcanism in central and southern Fildes Peninsula, King George Island, South Shetland Islands**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.487-491, 24 refs.

Volcanism on Fildes Peninsula occurred in three stages: I (tholeiitic rocks), II (calc-alkalien basalts and basaltic-andesites) and III (rocks with transitional characteristics); most of the volcanic rocks are of Eocene age. Isotopic studies show that these volcanic rocks have higher Sr-87/Sr-86 ratios than most mantle-derived volcanic rocks, and relatively more Pb-207 than MORBs and oceanic island basalts. *Delta*O-18 values for stage III lavas vary widely but are within the range for fresh mantle-derived volcanic rocks, whereas stage II lavas and some stage I rocks have *delta*O-18 values close to fresh oceanic basalts. The remaining stage I lavas have slightly high *delta*O-18 values due to interaction with seawater. MORB-normalized trace element patterns show an enrichment in Sr, K, Rb and Ba relative to the other trace elements (Ta-Cr), possibly due to alkali-rich fluids migrating from subducted ocean crust into the mantle source. Stage I basalts have low concentrations of high ionic elements and incompatible and compatible elements, but slightly higher LREE concentrations. Stage II lavas are enriched in alkali and alkaline-earth elements but have low concentrations of most incompatible elements; LREE concentrations are higher than in stage I rocks. (Auth.)

E-44190

Tokarski, A.K., **Late Cretaceous-Cenozoic structural history of King George Island, South Shetland Islands, and its plate-tectonic setting**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.493-497, 12 refs.

King George I. (KGI) comprises largely calc-alkaline volcanic and volcanogenic rocks, pierced by small calc-alkaline intrusions. Brittle deformation has affected most of this magmatic pile, resulting in tension gashes and strike-slip faults. Folding affected only those portions of the pile containing more clastic intercalations. Structural development of the KGI magmatic pile has been controlled largely by a strike-slip tectonic regime for the last 77 m.y. Three sets of extensional joints and dykes, parallel to the respective orientations of the main principal stresses, correspond to three deformation stages: (1) development of an ESE-orientated set of joints and dykes (set I), attributed to the eastward subduction of the ancient Pacific ocean crust (up to about 23 Ma); (2) development of another set (set II) reflecting the clockwise rotation of the main principal stress up to its recent WSW orientation, attributed to main plate reorganization

which resulted in cessation of subduction and opening of the Scotia Sea, and (3) development of set III, associated with the opening of the Bransfield Strait ((?)1.3 Ma-Recent). Bransfield Strait basin is interpreted as one of the zones of young volcanism in the northern Graham Land region. These zones reflect the push of the spreading ridges surrounding the antarctic plate. (Auth.)

E-44191

Guterch, A., Grad, M., Janik, T., Perchuć, E.,
Tectonophysical models of the crust between the Antarctic Peninsula and the South Shetland trench, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.499-504, 9 refs.

Seismic measurements, including multichannel seismic-reflection and deep seismic soundings, were carried out in the region of the west coast of the Antarctic Peninsula, Bransfield Strait, South Shetland Is., and South Shetland trench. The measurements were made along several lines with a total length of about 2500 km. Crustal sections and one- and two-dimensional models of the crust for this area are discussed in detail. The thickness of the crust ranges from 30-33 km in the South Shetland Is. to 38-45 km near the coast of the Antarctic Peninsula. The crustal structure beneath the trough of Bransfield Strait is highly anomalous; a seismic discontinuity with velocities of 7.0-7.2 km/s was found at a depth of about 10 km, and a second discontinuity with velocities of 7.6-7.7 km/s was found at a depth of 20-25 km. A seismic inhomogeneity along the Deception-Penguin-Bridgeman Islands volcanic line has also been found. A scheme for the geotectonic division and a geodynamic model of the area are discussed. (Auth.)

E-44194

Ringe, M.J., **Volcanism on Brabant island, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.515-519, 13 refs.

A brief description of the geology of Brabant I. is given. Cretaceous or older tuffs and agglomerates are predominant in the southern part of the island, and these are overlain by a thick and lithologically variable buff-colored volcanoclastic deposit. A thick lava and tuff pile which forms the main ridge on the west coast of the island represents continuing magmatism during the Tertiary. Ages of 3.07 Ma (from an andesite lava) and 24.0 Ma and about 10 Ma (for two intrusions) confirm this time span. Activity ended when subduction of the Aluk ridge ceased 4 Ma ago. There followed a period of extension in the Bransfield Strait area and it is envisaged that Recent volcanism on Brabant I. was related to this episode. A multi-phase dyke swarm in southeastern Brabant I. is indicative of extensional tectonics related to the ridge-trench movements farther west, and subsequent rifting in Gerlache Strait. A 52 Ma age suggests extension may have begun in the early Tertiary. Petrological and geochemical data are given for the Recent volcanic rocks. (Auth.)

E-44195

Hole, M.J., Smellie, J.L., Marriner, G.F., **Geochemistry and tectonic setting of Cenozoic alkaline basalts from Alexander Island, Antarctic Peninsula**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.521-526, 17 refs.

Scattered outcrops of Cenozoic alkaline basalts on Alexander I. represent part of the major alkaline basalt province which extends from New Zealand to South America. All the Alexander I. basalts post-date the cessation of subduction along the western margin of the

Antarctic Peninsula. Those in northern Alexander I. fall in the field of alkalic magmas in Ta/Yb, Th/Yb space, whilst samples from Beethoven Peninsula, southern Alexander I., plot just above the field for transitional magma types. The Beethoven Peninsula samples exhibit lesser degrees of LREE-enrichment and have significantly higher Th/Ta and Yb/Ta ratios than the samples from northern Alexander I., even though the latter exhibit the highest absolute Th abundances. Sr-87/Sr-86 ratios show a positive correlation with both Th/Ta and Yb/Ta ratios, the Beethoven Peninsula samples exhibiting significantly higher Sr-isotope ratios than those from northern Alexander I. The varying degrees of LREE-, LIL-element and Sr-87 enrichment must reflect variable source compositions and/or variable degrees of partial melting within the different areas of Alexander I. The higher Th/Ta and Sr-87/Sr-86 ratios of the Beethoven Peninsula samples may reflect a minor subduction zone component inherited from the previous subduction history of the west coast of the Antarctic Peninsula. (Auth.)

E-44197

LeMasurier, W.E., Rex, D.C., **Tectonic significance of linear volcanic ranges in Marie Byrd Land in late Cenozoic time (Extended abstract)**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.531-532, 3 refs.

The model proposed as an explanation of the patterns described takes cognizance of the fact that the MBL province lies on the flank of the West Antarctic rift system, and that volcanism in this region has been accompanied by extensional block faulting throughout the past 25 m.y. The major points of the model are outlined. This model implies that rifting has been recurrent in MBL. Since it does not depend on plate motion to form the linear ranges, the model also implies that the late Cenozoic rifting is a thermally driven event, but a less intense one than the late Mesozoic rifting that produced the Pacific-antarctic ridge. The isotopic composition of the basalts is consistent with an asthenospheric source, and a rise of the asthenosphere/lithosphere boundary may be the fundamental cause of crustal doming and associated rifting in this province.

E-44198

Lawver, L.A., Royer, J.Y., Sandwell, D.T., Scotese, C.R., **Evolution of the antarctic continental margins**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.533-539, 31 refs.

With the exception of the Pacific-facing margin of West Antarctica between Thurston I. and the tip of the Antarctic Peninsula, all of the continental margins of Antarctica are either rifted passive margins or sheared transform margins. The exception was a convergent margin where subduction was active from before the break-up of Gondwana until very recently. Starting in the southwestern Weddell Sea, which rifted as part of a back-arc basin connected with Middle-Late Jurassic back-arc spreading in the Rocas Verdes Basin of southern South America, the continental margins of Antarctica seem to young clockwise. A sheared margin along the Explora Escarpment between 25 and 10W connected the southwestern Weddell Sea rifting with contemporaneous rifting in the Mozambique Basin. This resulted in a Middle Jurassic rifted passive margin along Dronning Maud Land. East of the Gunnerus Ridge at 35E, Sri Lanka and India rifted off of Antarctica some time between 127 and 118 Ma. Rifting between Australia and Antarctica, stretching in the Ross Sea embayment and rifting between the Campbell Plateau-Chatham Rise and Marie Byrd Land, all started at about 95 Ma. Active subduction ceased about 4 Ma ago off the South Shetlands Is. (Auth.)

E-44215

Mitchell, N.C., **Distributed extension at the Indian Ocean triple junction**, *Journal of geophysical research*, May 10, 1991 96(B5), p.8019-8043, Refs. p.8041-8043.

At 25.5S, 70E the Indian Ocean triple junction joins three major spreading ridges. Otherwise called the Rodriguez triple junction, it connects the Southwest Indian Ridge (SWIR), the Southeast Indian Ridge (SEIR), and the Central Indian Ridge (CIR). New seafloor is created continually along the CIR and SEIR spreading axes, which subsequently moves progressively to the southwest. Because the CIR and SEIR axes are connected in a bend at the triple junction and because the seafloor forming on the southwest flanks of the CIR and SEIR is attached to two separate and diverging blocks, the African and antarctic tectonic plates, the two regions of seafloor slowly part north-south, forming a wide zone of distributed deformation between them. The lithosphere along the line of the SWIR progressively necks by pervasive extensional faulting until the underlying asthenosphere has risen sufficiently to decompress and partially melt, allowing "normal" seafloor spreading to begin at some distance (perhaps 35 km) from the triple junction. (Auth. mod.)

E-44226

Matsumoto, G.I., Hirai, A., Hirota, K., Watanuki, K., **Organic geochemistry of the McMurdo Dry Valleys soil, Antarctica**, *Organic geochemistry*, 1990 16(4-6), p.781-791, Refs. p.790-791.

Organic geochemical studies of 12 soil samples from Wright and Taylor Valleys were carried out. Long-chain *n*-alkanoic acids (C20-C34), with a predominance of even-carbon numbers, were abundant in all the samples. 3-Hydroxy acids (C8-C30) with a predominance of even-carbon numbers were found in the samples, together with 2-, *omega*- and (*omega*-1)-hydroxy acids. *Alpha,omega*-Dicarboxylic acids (C8-C31) were detected having near-unity values of carbon preference indices; mainly the C13 dicarboxylic acid predominated. Visual kerogen revealed that amorphous materials are major components (68-98%) with small amounts of very fine coals (2-32%), but no woody or herbaceous materials. The occurrence of mature isomers of steranes and triterpanes, the paucity of *n*-alkenoic acids and data from the microscopic study suggest that organic components in the soil samples are derived from erosion of Beacon Supergroup sedimentary rocks and past biological debris containing vascular plant waxes, as well as wind-transported cyanobacterial mats, including cyanobacteria, microalgae, bacteria and fungi, rather than from living organisms. (Auth.)

E-44227

Maurette, M., **C-rich micrometeorites on the early Earth and icy planetary bodies**, Formation of stars and planets, and the evolution of the solar system, edited by B. Battrock, Paris, European Space Agency, 1990, p.167-172, N91-18947, 7 refs.

The analysis of about 200 mg of 50 to 100 mg size dust particles extracted from 100 tons of antarctic blue ice is reported. This dust constitutes the purest and the best preserved source of giant Unmelted Chondritic Micrometeorites (UMCs) recovered from terrestrial sediments. Both the bulk composition of UMCs and their crystal chemistry indicate that at least 95% of them are relative to primitive unequilibrated meteorites. They are mostly composed of porous aggregates of submicron size grains, that contain substituted aromatic organic compounds. UMCs might have functioned as minicenters of prebiotic synthesis on the early Earth. (Auth.)

E-44239

Elliot, D.H., **Triassic-Early Cretaceous evolution of Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.541-548, 38 refs.

Palaeomagnetic data suggest that Antarctica has existed in its present form from the mid-Cretaceous, and therefore all major reorganization of the original Pacific margin of Gondwana took place in late Middle Jurassic-Early Cretaceous time. Geological evidence indicates that the major translations and rotations must have occurred in the back-arc region of the Gondwana active plate margin which spanned at least the Permian-Triassic. In this region, thermal perturbations associated with break-up induced doming and erosion, and silicic and tholeiitic magmatism. This was also accompanied or followed by crustal extension. Initial movements between East and West Gondwana must have been accommodated in this extensional zone while subduction was active along the Pacific margin. Constraints on reassembly and movements of crustal blocks are given by palaeomagnetic data and Mesozoic seafloor magnetic anomaly data off Queen Maud Land, including the Weddell Sea. The Explora and Andenes escarpments may reflect early movements as well as later rifting. Critical data for understanding the early evolution of the Antarctic Plate include the Weddell Sea M anomalies, and the nature and age of the Explora-Andenes Escarpment. (Auth.)

E-44242

Harris, C., Erlank, A.J., Duncan, A.R., Marsh, J.S., **Geochemistry of the Kirwan and other Jurassic basalts of Dronning Maud Land, and their significance for Gondwana reconstruction**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.563-568, 22 refs.

The Kirwan Volcanics are all basalts with a restricted compositional range, SiO₂ 50.1-52.1 wt%; MgO 5.1-6.6 wt%. They are very similar in composition to the adjacent Heimefrontfjella basalts but differ from the more varied Vestfjella basalts of MgO 5-25 wt%. The Kirwan basalts are chemically and isotopically similar to the Karoo basalts of the southern Lebombo in southern Africa, which is consistent with the juxtaposition of these areas in most accepted reconstructions of Gondwana. Contemporaneous basic dykes to the east of Kirwanveggen are chemically more variable and their higher concentration of certain incompatible elements is reminiscent of the 'enriched' northern province of the Karoo volcanics. In southern Africa, geochemical provinces are considered to be the result of large-scale mantle heterogeneity, and it is suggested that a similar situation exists in Antarctica. (Auth.)

E-44243

Brewer, T.S., Brook, D., **Geochemistry of Mesozoic tholeiites from Coats Land and Dronning Maud Land**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.569-572, 18 refs.

Mesozoic tholeiites from Coats Land and Dronning Maud Land can be divided into two groups: those with high TiO₂ and those with low TiO₂. All of these compositions have trace element signatures that are more characteristic of subduction-related volcanism than within-plate volcanism. However, this interpretation is inconsistent with the major element compositions and the tectonic environment of formation of the tholeiites. Samples from the Theron Mountains have Nd model and isochron ages considerably older than their stratigraphical age. In an attempt to explain the trace element and isotopic systematics of the tholeiites, a model involving a previous mantle-

enrichment event has been developed. This model is similar to those developed for the Karoo and Paraná Mesozoic provinces. Thus, it would appear that the subcontinental Gondwana mantle inherited its geochemical characteristics from earlier geological events in Africa, South America and Antarctica. (Auth.)

E-44244

Pankhurst, R.J., Storey, B.C., Millar, I.L., **Magmatism related to the break-up of Gondwana**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.573-579, 15 refs.

Early-Middle Jurassic magmatism is widespread throughout West Antarctica. In the Ellsworth-Whitmore Mountains (EWM) crustal block it is mostly granitic, whereas in the Transantarctic Mountains (TAM) it is largely volcanic or hypabyssal in style and basaltic in composition. New Rb-Sr data are presented for plutons from the Whitmore Mountains and the Martin and Hart hills (EWM), and Lewis Nunatak (TAM). The Whitmore Mountains granites record two separate intrusive episodes. The Linck Nunatak granite gives an errorchron of 176 Ma, typical of the previously recognized Ellsworth-Whitmore granite suite. Its initial Sr-87/Sr-86 ratio of 0.7232 reflects a very high crustal contribution, probably through anatexis of underlying basement rocks. The Mount Seelig granite gives an errorchron age of 203 Ma with an initial Sr-87/Sr-86 ratio of 0.7068. The Martin Hills granitic stock displays variable initial Sr-87/Sr-86 ratios of about 0.718. The gabbro outcrops at Hart Hills and Lewis Nunatak have isotopic characteristics comparable with the Ferrar Supergroup (TAM). The Middle Jurassic igneous rocks of Antarctica form a distinctive bimodal, within-plate igneous suite, connected with the initial break-up of the Gondwana supercontinent. (Auth.)

E-44247

Smith, A.G., Livermore, R.A., **Hotlines and Cenozoic volcanism in East Antarctica and eastern Australia**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.593-597, 33 refs.

Synthetic hotspot tracks have been constructed for Cenozoic volcanic sites in eastern Australia and East Antarctica using recently revised rotations. For eastern Australia, several tracks reach either the Tasman Sea or Coral Sea margins when those margins were beginning to form. This relationship may be causal. In East Antarctica most tracks cross the Eastern basin of the Ross Sea at about 60-80 Ma, suggesting that the late Cenozoic volcanism in East Antarctica can be plausibly attributed to the migration of a distributed Late Cretaceous-early Cenozoic heat source originally under the Eastern basin. (Auth.)

E-44248

Webb, P.N., **Review of the Cenozoic stratigraphy and palaeontology of Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.599-607, 79 refs.

Abyssal sediments in Cenozoic basins include claystones, diatomaceous and calcareous nannoplankton oozes, cherts and chalks. Continental shelf sediments are dominated by biogenic and clastic sediments, including glaciomarine diamictites. Shelf sediments are differentiated into packets of contrasting clastic sediments, often separated by geographically widespread erosional contacts. Sedimentary cycles, representing marine transgressions and regressions, are apparent in many shelf successions and result from regional tectonics, sea-

level fluctuation or some combination of the two. Glaciation in the marine shelf basins of the Ross Sea dates from at least the early Oligocene, but there is evidence from King George I. for glaciation in the early Palaeogene. Polar abyssal basins first show evidence for glaciation in the Neogene. The continental shelf marine record indicates a complex glacial-interglacial record on Antarctica during the past 36 million years. From the inception of glaciation, marine incursions deep into and across Antarctica are probably associated with periods of ice-sheet recession. The palaeontologic data base has undergone a radical improvement over the past two decades and now contributes to the solution of a wide range of biostratigraphic, palaeontologic, biogeographic, palaeoceanographic and evolutionary studies within and beyond the south polar basins. Diatoms, silicoflagellates, and benthic foraminifera have been used in the development of biostratigraphy. (Auth. mod.)

E-44249

Huber, B.T., **Foraminiferal biogeography of the Late Cretaceous southern high latitudes**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.609-615, 47 refs.

The foraminiferal Austral Province of the Late Cretaceous is defined by the absence of warm-water planktonic and benthonic foraminifera and the presence of distinctive species endemic to the southern high latitudes. Campanian-Maastrichtian planktonic foraminiferal faunas from the Falkland Plateau, northern Antarctic Peninsula and Weddell basin are nearly identical. These assemblages lack thermophilic keeled species, are very low in diversity, and are dominated by simple, globular forms that probably inhabited the uppermost part of the water column. Benthonic foraminiferal assemblages from southern South America, the northern Antarctic Peninsula and New Zealand are quite similar, and indicate that some marine communication must have existed between these regions via trans-antarctic passages or along the antarctic margin of the Pacific Ocean. Temporal variations in the northern limits of the Austral Province during the Late Cretaceous are generally difficult to detect due to stratigraphic and geographic gaps in the high-latitude record. At present, the most complete foraminiferal record of palaeoclimatic and palaeoceanographic change for the Cretaceous southern high latitudes comes from the Falkland Plateau; other sites recently drilled in the southern South Atlantic and Weddell basin will provide much new information. (Auth.)

E-44250

Olivero, E.B., Gasparini, Z., Rinaldi, C.A., Scasso, R., **First record of dinosaurs in Antarctica (Upper Cretaceous, James Ross Island): palaeogeographical implications**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.617-622, 24 refs.

During the austral summer of 1986, fieldwork on James Ross I. by the Instituto Antártico Argentino resulted in the discovery of the first remains of dinosaurs from the antarctic continent. These consist of a partial skeleton and bony plates of an armored ornithischian belonging to the Ankylosauria. The fossil material was found in marine sandy-facies of the Santa Marta Formation of Campanian age. The remains were associated with marine invertebrates. At a slightly higher stratigraphic level, marine reptiles related to mosasaurs and plesiosaurs were also found. The occurrence of ankylosaurs on James Ross I. provides important new insight concerning hypotheses of land connections between South America and Antarctica during the Late Cretaceous. An earlier differentiation of the family Ankylosauridae and the distribution of these dinosaurs in Antarctica during the Late Jurassic-Early Cretaceous cannot be completely ruled

out. However, a late entrance of northern ankylosaurids into Antarctica, via South America, is considered more likely. Because it was not possible for these ankylosaurs to cross water barriers, their presence indicates that a continuous land connection must have existed between Antarctica and South America for some period of time during the Late Cretaceous. (Auth.)

E-44251

Francis, J.E., **Palaeoclimatic significance of Cretaceous-early Tertiary fossil forests of the Antarctic Peninsula**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.623-627, 14 refs.

During the Cretaceous and early Tertiary forests grew on the volcanic arc which now forms the Antarctic Peninsula. The wood of the trees was subsequently permineralized and identification of these fossils indicates that the forests were composed of predominantly podocarp and araucarian conifers and some rarer conifer types. Broad-leaved angiosperms became increasingly common during the Late Cretaceous. Fossils of the southern beech (*Nothofagus*) occur for the first time in Campanian strata on Seymour I. and represent the earliest record of *Nothofagus* macrofossils worldwide. These forests were the ancestral stock of the temperate evergreen forests of South America and Australasia today. Growth rings are consistently wide and uniform throughout most of the Antarctic Peninsula Cretaceous and Eocene wood, indicating that the forest environment was very favorable for tree growth. Both the forest composition and the tree-ring patterns are comparable to those of modern cool (or possibly warm) temperate forests such as those in New Zealand or Tasmania. However, there is a radical short-term change in growth ring patterns in upper Maastrichtian and Palaeocene wood from Seymour I. The rings are extremely narrow, indicating that tree growth was very slow. This may have been in response to a marked cooling of the climate during the Cretaceous-Tertiary transition. (Auth.)

E-44252

Birkenmajer, K., **Tertiary glaciation in the South Shetland Islands, West Antarctica: evaluation of data**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.629-632, 25 refs.

Evidence for at least four Tertiary glacial events is provided from King George I., South Shetland Is. The oldest (Kraków Glaciation) is documented by fossiliferous glaciomarine sedimentary rocks passing upward into basaltic hyaloclastite capped by basaltic lava with a K-Ar age of about 49.4 Ma (Eocene). The next glacial event (Polonez Glaciation) was probably antarctic-wide and is well documented by lodgement till and the succeeding fossiliferous glaciomarine sedimentary rocks, capped by andesite-dacite lavas yielding a K-Ar age of >23.6 Ma. Both the Polonez Glaciation deposits and the capping lavas were deeply eroded and redeposited as fluvial and debris-flow clastics during an interglacial-type climatic event (Wesele Interglacial). These clastics are themselves overlain by subaerial, predominantly andesite lavas alternating with lahar-type clastics and cut by narrow buried valleys filled with continental glacial tillite (Legru Bay Group). K-Ar dating of the lavas yielded ages between 29.5 and 25.7 Ma, suggesting a late Oligocene age for the Legru Glaciation. *Nothofagus*-podocarp assemblages, which occur in the upper part of the volcanic-sedimentary Point Hennequin Group (Mount Wawel Formation), dated at 24.5 Ma, may represent another interglacial-type climatic event (Wawel Interglacial). The Melville Glaciation (early Miocene, about 22-20 Ma) is well constrained by fossiliferous marine tillite and associated K-Ar-dated volcanic rocks. (Auth.)

E-44257

McIntosh, W.C., Gamble, J.A., **Subaerial eruptive environment for the Hallett Coast volcanoes**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.657-661, 17 refs.

Subaerial volcanic rocks show that the late Miocene-Pliocene (13-2.5 Ma) Hallett Coast shield volcanoes did not erupt and accumulate beneath a continental ice sheet. Subaerial lavas, lava-flow breccias, and subordinate pyroclastic deposits form four large (>100 cu km), elongate shield complexes. Most of the pyroclastic deposits are subaerial Hawaiian or Strombolian bomb and lapilli units, commonly showing welding or deuteric haematitic oxidation. Associated with the Hawaiian and Strombolian units are less abundant hydrovolcanic (Surtseyan) deposits erupted and deposited subaerially or in shallow water. The deposits are composed of poorly sorted, variably bedded tuffs and lapilli-tuffs, some containing accretionary lapilli. Breccias at the base of most lava flows consist of clast-supported, oxidized, vesicular fragments of holocrystalline lava, indicating subaerial emplacement. Pillows or glassy breccias at the base of a few lava flows probably reflect interaction with limited amounts of ice and snow in a periglacial environment. The predominance of subaerial volcanic rocks shows that a fully expanded Ross Ice Sheet was absent during most of the emplacement of the Hallett Coast volcanoes. However, syn- and post-volcanic advances of a regional ice sheet from the west are recorded along the northern end of Adare Peninsula by a glacial unconformity and erratics. (Auth.)

E-44258

Birkenmajer, K., **Origin and age of pectinid-bearing conglomerate (Tertiary) on King George Island, West Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.663-665, 17 refs.

The pectinid-bearing conglomerate on King George I. is interpreted as the nearshore deposit of a high-energy wave-dominated coast. K-Ar dating of associated volcanic rocks and calcareous nannoplankton point to an Oligocene age for the conglomerate. It is concluded that the pectinid-bearing sedimentary rocks from King George I. do not correlate with the *Pecten* conglomerate of Cockburn I., which is regarded as Pliocene in age. (Auth.)

E-44259

Harwood, D.M., **Cenozoic diatom biogeography in the southern high latitudes: inferred biogeographic barriers and progressive endemism**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.667-673, 59 refs.

In the past the paucity of diatom data from marine sequences in Antarctica limited the ability to relate palaeoceanographic events, thought to result from climatic changes in the south polar region, to the physical evidence for these events on the antarctic continent. Reworked marine diatoms and diatomaceous clasts from the Sirius Group, which provide a unique record of Cenozoic marine sedimentation in East Antarctica, and results from drillholes in McMurdo Sound (MSSTS & CIROS), offer new information to fill this void. In this paper, the composition of fossil diatom assemblages from interior basins of East and West Antarctica and the southern ocean are compared in order to help understand the nature, cause and timing of Cenozoic marine communications and/or palaeobiogeographic barriers between these three regions. Available data on diatoms from DSDP cores in the southern ocean, from coastal outcrops and drill-

cores on the antarctic shelf and margin, and from continental and marine glacial sediments, are reviewed. The history of southern high-latitude diatom palaeobiogeography and the development of modern diatom floras, which are endemic to various water masses in this region, were controlled by the climatic evolution of the antarctic region. (Auth.)

E-44260

McKelvey, B.C., Webb, P.N., Harwood, D.M., Mabin, M.C.G., **Dominion Range Sirius Group: a record of the late Pliocene-early Pleistocene Beardmore Glacier**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.675-682, 26 refs.

On Oliver Platform in the Dominion Range, late Pliocene and/or early Pleistocene Sirius Group strata include the 185 m thick Meyer Desert Formation, composed predominantly of semi-lithified fossil-bearing coarse lodgement tillites and minor fluvioglacial and glaciolacustrine deposits. Fossils include *in situ* *Nothofagus* fragments, palynomorphs, and a variety of Cenozoic marine microfossils reworked from the Pensacola subglacial basin of East Antarctica. Approximately 6 km farther west a 50 m thick section of the younger Mount Mills Formation of the Sirius Group consists of coarse fluvioglacial diamictites, conglomerates and breccias. The Meyer Desert Formation rests disconformably via the glacially cut Dominion Erosion Surface on Mesozoic strata at between 1800 m and 2650 m above sea level. This altitude range reflects original relief on the uplifted erosion surface. The latter is a composite one representing at least two separate phases of cutting separated by uplift. Consequently the mantling Meyer Desert Formation records two (or more) separate periods of deposition, and the sequence has been subsequently uplifted more than 1300 m. The Dominion Range Sirius Group is interpreted as the uplifted late Pliocene and/or early Pleistocene record of Beardmore Glacier, then flowing at an approximately 1300 m lower altitude. The Sirius Group strata and the fossil plants indicate a much more temperate setting than at present, with temperatures being in the order of 15-20 °C warmer. (Auth. mod.)

E-44261

Quilty, P.G., **Geology of Marine Plain, Vestfold Hills, East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.683-686, 16 refs.

A new genus and species of mid-Pliocene dolphin is being described from diatomites of Marine Plain near Davis Station in the Vestfold Hills. The original discovery consists of an almost complete upper jaw, and skull and other material has since been found. The remains come from a 7-8 m thick marine diatomite covering some 10 sq km, a few meters above sea level. The accompanying macrofauna consists of bivalves and gastropods. Dating was achieved using molluscs, diatoms and racemization of protein, after radiocarbon results showed the sediments to be considerably older than mid-Holocene sediments which are quite widespread in the Vestfold Hills. Vertebrate fossils seem to be common and it is hoped that the area will yield other remains, in particular the seals and birds which lived at the time. The dolphin is the only vertebrate fossil known from Antarctica since the present ecosystem evolved, probably about the time of development of the Antarctic Convergence. Preliminary oxygen isotope studies suggest a palaeotemperature significantly above today's levels, and the sediments are being studied by palynology to determine whether any flora existed at the time. This article provides a brief description of the geological environment in which the new genus of vertebrate was found, including Pliocene diatomites and Holocene glacial sediments. (Auth. mod.)

E-44262

Anderson, J.B., Bartek, L.R., Thomas, M.A., **Seismic and sedimentological record of glacial events on the Antarctic Peninsula shelf**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.687-691, 9 refs.

Seismic-reflection profiles from the continental shelf of the Antarctic Peninsula reveal a similar sequence of events to other parts of the antarctic continental shelf (Ross Sea and Weddell Sea). Basal sequences consist of seaward-accreting sediment wedges bounded by widespread unconformities and imply relatively shallow-water deposition. There followed a prolonged period of glacial erosion and deposition, which resulted in the present deep and rugged topography of the shelf. The initial seaward advance of the ice sheet onto the shelf would have occurred as falling sea level exposed the inner shelf, and does not necessarily imply dramatic climatic cooling. Furthermore, once the deep, rugged shelf topography was created, waxing and waning of marine ice sheets became strongly linked to sea level changes and may not have been in harmony with Southern Hemisphere climatic events. Following this episode the shelf was draped by glaciomarine deposits, and deep-sea fans of the Bellinghousen abyssal plain were buried beneath hemipelagic and pelagic sediments. A later ((?)Plio-Pleistocene) episode of ice-sheet expansion onto the shelf resulted in widespread till deposition and renewed deep-sea fan activity. The five stages of the model development of these events are shown in figures and described in the text. (Auth. mod.)

E-44263

Domack, E.W., Jull, A.J.T., Anderson, J.B., Linick, T.W., **Mid-Holocene ice sheet recession from the Wilkes Land continental shelf, East Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.693-698, 30 refs.

Sediments from the Wilkes Land continental shelf and slope, East Antarctica, record a history of late Pleistocene-mid Holocene ice sheet retreat and modern biogenic sedimentation. This chronology is based on five samples of foraminifera and organic carbon, which were analyzed for their C-14 content. Most of the dates are <7850 C-14 y BP, with one date of 14260 y BP from the shelf break. The chronology, stratigraphy and shelf morphology indicate that grounded ice extended out to the shelf edge, but only within the confines of deep-shelf depressions and troughs. Relatively shallow, broad and low relief portions of the shelf apparently escaped glaciation during the most recent glacial maximum. Recession of glacial ice from the shelf was most likely in response to rising relative sea level which initiated the development of floating ice tongues within the ice drainage system. This event took place some time after 9000 y BP and most probably prior to 3000 y BP. Further application of the accelerator method to other sediment cores, which predate the latest ice advance, should help clarify the above hypotheses. (Auth.)

E-44264

Ishman, S.E., **Benthic foraminiferal ecology of the Antarctic Peninsula Pacific coast**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.699-705, 19 refs.

Foraminiferal analyses of 12 surface sediment samples taken from 12 sites along the west coast of the Antarctic Peninsula demonstrate regional variation in faunal distributions. The three regions investigated, South Shetland Is., Danco Coast and Marguerite Bay, have

distinct calcareous benthic-agglutinated foraminiferal distributions. In addition, faunal correlations between these regions demonstrate greater affinities between those faunas from the more restricted South Shetland Is. and Danco Coast bays than those from the Marguerite Bay sites. The faunal distributions observed are related to bottom-water mass variations, which are influenced by: (1) a high-latitude thermal gradient influencing climatic patterns and thus localized bottom-water conditions; (2) variation in physiographic configurations of the three regions; and/or (3) production of CaCO_3 corrosive bottom waters from adjacent ice shelves in the Marguerite Bay region and little to no corrosive bottom-water production in the South Shetland Is. or Danco Coast regions; or possibly the physico-chemical conditions of the sediments. A greater understanding of modern benthic foraminiferal ecology in the high southern latitudes will lead to more comprehensive palaeoenvironmental interpretations for the Cenozoic. (Auth.)

E-44278

Kagami, H., Iwasaki, T., **Variation of natural levees of submarine canyons around Antarctica—an indicator of antarctic contour-current**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.108-118, 19 refs.

Natural levees developing at the western side of the submarine canyons on the continental rise around the antarctic continent are for the first time described quantitatively. It is found that they apparently involve large benthic flow. The observations presented here suggest that the benthic flow may be caused by a combination of bottom-trapped Rossby waves, the background mean current which most probably consists of Antarctic Bottom Water, and high-frequency tidal flow. (Auth.)

E-44303

Ivanov, V.L., ed, Kamenev, E.N., ed, **Geology and mineral resources of Antarctica** [Geologiya i mineral'nye resursy Antarktidy], Moscow, Nedra, 1990, 231p., In Russian. 75 refs.

Within the framework of an extensive review of pertinent literature, the 5 chapters of this book deal, respectively, with an historic outline of geological and geophysical investigations in Antarctica, the structural and mineralogical zonation of Antarctica, the geology of antarctic continental shield and its potential ore deposits, the sedimentary basins of Antarctica as potential oil sources, and an analysis of what has been achieved so far, as well as the problems that still remain unsolved in antarctic geological and geophysical research.

E-44328

Campanella, L., Ferri, T., Petronio, B.M., Pupella, A., **Study of humic components of soils and sediments from Antarctica**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.89-93, 3 refs.

Humic and fulvic acids extracted from marine sediments, lacustrine sediments and soils from Antarctica have been characterized using different techniques. The results obtained have been compared with those reported in the literature and the differences found are pointed out. (Auth.)

E-44334

Bettoli, M.G., Tositti, L., Tubertini, O., Cantelli, L., **Distribution of natural and artificial radionuclides in the Ross Sea region-Antarctica**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.127-131, 9 refs.

Data collected by several Italian antarctic expeditions are analyzed. The concentrations of natural and artificial gamma-emitting radionuclides in some marine and terrestrial matrices were studied with the aim of determining their distribution in the Ross Sea region and to provide a historical record of the various influences on the environment. (Auth. mod.)

E-44335

Triulzi, C., Mangia, A., Mori, A., Nonnis-Marzano, F., **Radioactivity in some environmental marine and terrestrial matrices collected around the Italian base in Antarctica**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.133-141, 7 refs.

Samples of different environmental matrices, such as marine organisms, sediments and sea water; lake water, plants and sediments, and soil, moss and lichen, collected around the Terra Nova Bay Station in 1988-89, were analyzed to determine Cs-137, K-40, Th-232 and U-238. Other data concerning coastal and offshore sea sediments (1987-88) are also presented. Data are compared to those obtained during the previous scientific expedition. (Auth. mod.)

E-44336

Battiston, G., Degetto, S., Gerbasì, R., Sbrignadello, G., **Radionuclide analysis in antarctic coastal samples: methods and procedures**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.143-147.

Preliminary results are given of radiochemical analyses performed on snow, lichen (*Umbilicaria Decussata*) and moss (*Bryum Algens Card.*) samples collected near the Terra Nova Bay Station during the 1988-89 Italian expedition. Data on Pb-210 and Cs-137 for the analyzed samples, and some preliminary results on multielemental characterization of snow water, are presented. (Auth.)

E-44340

Harley, S.L., Fitzsimons, I.C.W., **Pressure-temperature evolution of metapelitic granulites in a polymetamorphic terrane: the Rauer Group, East Antarctica**, *Journal of metamorphic geology*, May 1991 9(3), p.231-243, Refs. p.242-243.

Distinctive lithological associations and geological relationships, and initial geochronological results indicate the presence of an areally extensive region of reworked Archaean basement containing polymetamorphic granulites in the Rauer Group, East Antarctica. Structurally early metapelites from within this reworked region preserve complex and varied metamorphic histories which largely pre-date and bear no relation to a Late Proterozoic metamorphism generally recognized in this part of East Antarctica. In particular, magne-

sian metapelite rafts from Long Point record extreme peak P-T conditions of 10-12 kbar and 1000-1050 C, and an initial decompression to 8 kbar at temperatures of greater than 900 C. Initial garnet-orthopyroxene-sillimanite assemblages contain the most magnesian (and pyrope-rich) garnets yet found in granulite facies rocks. This history is thought to relate to Archaean events, whereas a lower-temperature (c. 750-800 C) decompression to 5 kbar reflects Late Proterozoic reworking of these relict assemblages. The major Late Proterozoic (c. 1000 Ma) granulite facies metamorphism is recorded in a suite of younger Fe-rich metapelites and associated paragneisses in which syn-to post-deformational decompression, through 2-4 kbar from maximum recorded P-T conditions of 7-9 kbar and 800-850 C, is constrained by geothermobarometry and reaction-textures. This P-T evolution is thought to reflect rapid tectonic collapse of crust previously thickened through collision. (Auth. mod.)

E-44341

Thost, D.E., Hensen, B.J., Motoyoshi, Y., **Two-stage decompression in garnet-bearing mafic granulites from Söstrene Island, Prydz Bay, East Antarctica**, *Journal of metamorphic geology*, May 1991 9(3), p.245-256, 28 refs.

Mafic garnet-bearing granulites from Söstrene I. exhibit two-stage symplectic coronas on garnet, formed after peak metamorphic conditions (M1). Both symplectites contain minor ilmenite-magnetite intergrowths. The finer-grained symplectite also occurs along a fracture cleavage in the garnet. The outer corona originated during a second metamorphic event (M2), whereas the inner corona formed later in response to decompression and minor deformation, resulting in the fracture cleavage in the garnet. The mafic rocks are silica undersaturated. Preferred P-T estimates for M1 based on garnet core matrix Opx-Cpx-Hbl pairs are c. 10 kbar at 980 C. The fine-grained symplectite formed post-peak M2 at c. 7 kbar and 850 C. The enclosing felsic gneisses yield pressure estimates of between 5 and 7 kbar, which compare with conditions of c. 6 kbar and 775 C in the nearby Bolingen Is. These lower P-T estimates are considered to be representative of the widespread 1100-Ma metamorphic event recognized in outcrops along the Prydz Bay coast. The high-P, high-T estimates derived from the garnet relics provide evidence for an earlier, possibly Archaean, high-grade metamorphic event. (Auth. mod.)

E-44342

Nichols, G.T., Berry, R.F., **Decompressional P-T path, Reinbolt Hills, East Antarctica**, *Journal of metamorphic geology*, May 1991 9(3), p.257-266, Refs. p.265-266.

Granulites exposed in the Reinbolt Hills are part of the extensive Late Proterozoic granulite complex of East Antarctica, which includes the Rauer Group to the east and the northern Prince Charles Mountains to the west. The deformation history includes three pervasive deformation phases. No chemical or mineralogical distinction between these phases has been detected and this is interpreted to be the result of complete re-equilibration at the end of the third deformation phase. Two late deformation phases post-date the metamorphism and record a medium-temperature cooling path. A short segment of the P-T path of these rocks was inferred from mineral reactions that occurred during these late deformation phases. The path passes from 800 C, 7 kbar to 690 C, 5 kbar, indicating strong decompression, which is typical of a thrust-dominated crustal thickening followed by rapid erosion or extensional collapse. (Auth.)

E-44343

Motoyoshi, Y., Thost, D.E., Hensen, B.J., **Reaction textures in calc-silicate granulites from the Bölingen Islands, Prydz Bay, East Antarctica: implications for the retrograde P-T path**, *Journal of metamorphic geology*, May 1991 9(3), p.293-300, 28 refs.

Calc-silicate granulites from the Bölingen Is. exhibit a sequence of reaction textures that have been used to elucidate their retrograde P-T path. The highest temperature recorded in the calc-silicates is represented by the wollastonite- and scapolite-bearing assemblages which yield at least 760 C at 6 kbar based on experimental results. The calc-silicates have partially re-equilibrated at lower temperatures (down to 450 C) as evidenced by successive reactions. The reaction sequence observed indicates that a(CO₂) was relatively low in the wollastonite-bearing rocks during peak metamorphic conditions, and may have been further lowered by local infiltration of H₂O from the surrounding migmatitic gneisses on cooling. Fluid activities in the Bölingen calc-silicates were probably locally variable during the granulite facies metamorphism, and large-scale CO₂ advection did not occur. A retrograde P-T path, from the sillimanite stability field (c. 760 C at 6 kbar) into the andalusite stability field (c. 450 C at <3 kbar), is suggested by the occurrence of secondary andalusite in an adjacent cordierite-sillimanite gneiss in which sillimanite occurs as inclusions in cordierite. (Auth. mod.)

E-44365

Schandl, E.S., Gorton, M.P., Wicks, F.J., **Mineralogy and geochemistry of alkali basalts from Maud Rise, Weddell Sea, Antarctica**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.5-14, 43 refs.

DLC QE39.T49b

Basalts from Maud Rise, Weddell Sea, are vesicular and olivine-phyric. Major, trace, and rare earth element concentrations are similar to those of alkali basalts from ocean islands and seamounts. The rocks are low in MgO, Cr, Ni, and Sc, and high in TiO₂, K₂O, P₂O₅, Zr, and LREE contents. The abundance of "primary" biotite and apatite in the matrix indicates the melting of a hydrous mantle. Prevalence of olivine and absence of plagioclase in the rocks suggests that the volatile in the melt was an H₂O-CO₂ mixture, where H₂O was <0.5. Based on the presence of mantle xenocrysts, the high concentration of incompatible elements, the spatial and chemical affinity with other ocean island basalts from the area, and the relative age of the basalt (overlain by late Campanian sediments), it is suggested that Maud Rise was probably generated by hot-spot activity, possible during a ridge crest jump prior to 84 Ma (anomaly 34 time). (Auth. mod.)

E-44367

Lonsdale, M.J., **Relationship between silica diagenesis, methane, and seismic reflections on the South Orkney microcontinent**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.27-37, 21 refs.

DLC QE39.T49b

Seismic data acquired over the eastern shelf and margin of the South Orkney microcontinent have shown a high-amplitude reflection lying at a sub-bottom two-way travel time (TWT) of 0.5-0.8 s. There appear to be two causes for the reflection which apply in different parts of the shelf. The more widespread cause of the reflection is a break-up unconformity associated with the opening of Jane Basin to the east. This is clearly seen where reflections in the underlying sequence are discordant. In contrast, in Eotvos Basin and the southeastern part of Bouguer Basin, the high-amplitude reflection in places cuts across bedding and is interpreted to be caused by silica diagenesis. Analysis of core samples from the Eotvos Basin by X-ray diffraction and scanning electron microscopy revealed the presence of a silica diagenetic front at 520-530 mbsf. In Bouguer Basin the depth of the high-amplitude reflection was not reached by drilling; however, the

reflection is probably also caused by silica diagenesis because of the biogenic silica-rich composition of the sediments cored. The estimated temperatures and ages of the sediments at the depths of the high-amplitude reflections at both sites compare favorably with similar data from other diagenetic fronts of the world. The high-amplitude reflection in Bouguer Basin is commonly of inverse polarity, possibly caused either by interference between reflections from several closely-spaced reflecting layers, such as chert horizons, or by free gas trapped near the diagenetic front. (Auth. mod.)

E-44368

Fütterer, D.K., Kuhn, G., Schenke, H.W., **Wegener Canyon bathymetry and results from rock dredging near ODP Sites 691-693, eastern Weddell Sea, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.39-48, 22 refs.

DLC QE39.T49b

Systematic bathymetric surveys to map the Wegener Canyon with the multibeam sonar system SEABEAM were carried out during the *Polarstern* cruises in 1985, 1986, and 1987. Wegener Canyon is one of the larger canyon systems along the antarctic continental margin of the eastern Weddell sea. It represents a prominent northwest-trending system of deep incisions of variable depth, extending over about 85 km from the shelf break to the continental rise. On the lower continental slope the canyon has been cut to a depth of about 1200 m. It has a width of 4 km at the bottom and 10 km between its shoulders, and measures about 25 km in length. Mesozoic sediments were dredged at eight stations on the scarps on the southwestern flank of Wegener Canyon. Volcaniclastic sandstones and mudstones, nannofossil oozes, and claystones rich in organic matter were recovered. Physiographic and structural settings interpreted from seismic data, together with preliminary results from the lithologies recovered, clearly indicate that the beds cropping out in the upper scarp are as old as the Early Cretaceous sediments drilled at ODP Sites 692 and 693. The middle and lower scarps consist of lowermost Cretaceous to Upper Jurassic sediments, which were not reached by drilling, providing additional information for the interpretation of the pre-Valanginian/Aptian sedimentary environment in the Weddell Sea. (Auth. mod.)

E-44369

Robert, C., Maillot, H., **Paleoenvironments in the Weddell Sea area and antarctic climates, as deduced from clay mineral associations and geochemical data, ODP Leg 113**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.51-70, Refs. p.65-66.

DLC QE39.T49b

Clay particles in the Weddell Sea are mainly of detrital origin, eroded from soils as well as parent-rocks and ancient sediments. Contribution from volcanism is minor, and restricted to Early Cretaceous sediments on the Queen Maud Land continental margin, and to Late Cretaceous through early Paleocene deposits on Maud Rise. Generally, weak diagenetic processes are reflected mainly by recrystallization of smectite particles. Clay mineral and inorganic geochemical data provide information about the evolution of continental climate and oceanic circulation in antarctic areas adjacent to the Weddell Sea. Globally warm climates and alternating wet and arid periods prevailed in Antarctica during the Cretaceous and early Paleogene. By early Oligocene, cold climatic conditions inhibited pedogenesis in East Antarctica. Similar conditions extended to West Antarctica during the middle Miocene, when widening and deepening of the Drake Passage and Scotia Sea completed the thermal isolation of Antarctica. An important influence of Antarctic Water

circulation on clay sedimentation is apparent since middle Miocene off East Antarctica and early Pliocene off West Antarctica. (Auth. mod.)

E-44370

O'Connell, S.B., **Sedimentary facies and depositional environment of the lower Cretaceous east antarctic margin: Sites 692 and 693**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.71-88, Refs. p.86-88.

DLC QE39.T49b

Lower Cretaceous organic-rich sediments were recovered at Sites 692 and 693 on the eastern Weddell Sea margin during ODP Leg 113, below a major unconformity. Site 692 (2875 m water depth) is located on a mid-slope bench in Wegener Canyon. Early Cretaceous age sediments extend from 53 to 98 m below seafloor (mbsf) and are dominated by strongly laminated, organic-rich nannofossil claystone and mudstone with peloids, calcispheres, and radiolarians. Macrofossils, thin lenses and nodules containing carbonate-fluorapatite and fluid-escape structures are abundant. Thin beds of devitrified ash and poorly developed graded bedding are present. Site 693 (2360 m water depth), 30 km west of Site 692 on the outer canyon rim, yielded Albian age organic-rich claystones and mudstones from 416 to 484 mbsf. Site 693 sediments have organic contents lower than those at Site 692. Glauconite is common, and three thin limestone beds are present in the upper part of the unit. Well-preserved diatoms, radiolarians, and diatomite layers suggest that the sediments were deposited under conditions of high productivity. Ashclay layers with well-preserved glass shards indicate volcanic activity at the time of deposition. The sediments at both sites were deposited in an upper bathyal (500-1000 mbsl) marine environment under primarily dysaerobic conditions. (Auth. mod.)

E-44371

Smith, C.H., O'Connell, S.B., **Provenance and glacial history of very fine quartz sand from the Weddell Sea, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.89-109, Refs. p.104-105.

DLC QE39.T49b

Very fine quartz sand was examined from Paleogene and Neogene sediments of ODP Sites 693-697 to determine their grain roundness and surface texture characteristics unique to East (Site 693) and West (Sites 695, 696, and 697) Antarctica and to glacial regimes. Once identified, these distinguishing features could then be used to determine changes in source area and glacial conditions in the central Weddell Sea Basin (Site 694). Three end members of very fine quartz sand are recognized in the Oligocene to Pleistocene sediments of the Weddell Sea: angular, rounded, and intermediate. These sands are presumed to be derived from the Beacon-type rocks in East Antarctica and the sedimentary deposits of the northern Antarctic Peninsula, and from felsic intrusives, east antarctic quartzites, basement metamorphics of the South Orkney Microcontinent, and/or the Andean intrusive series of West Antarctica. No features unique to either the east or west antarctic sediment sources or to glacial conditions could be isolated. Therefore, the objective of determining provenance changes and sediment erosion and transport mechanisms could not be achieved using this approach. (Auth. mod.)

E-44372

Pudsey, C.J., **Grain size and diatom content of hemipelagic sediments at Site 697, ODP Leg 113: a record of Pliocene-Pleistocene climate**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.111-120, 36 refs.

DLC QE39.T49b

At Site 697 a 320 m thick Pleistocene and Pliocene section was recovered, consisting of hemipelagic terrigenous mud with varying amounts of diatoms, thin altered ash layers, and ice-rafted debris (IRD). Sedimentation rates range from 41 m/m.y. (upper Pleistocene) to 150 m/m.y. (lower Pliocene). Diatom percentage and sediment grain-size have been measured for the whole section with approximately one sample per 5,000 yr. IRD is most abundant in the lower Pliocene (sediments older than 4.5 Ma) following the first major west antarctic glaciation. A decrease in IRD to near-zero above 3.2 Ma may record a transition from valley glaciers to a grounded ice-sheet on West Antarctica. Bottom current flow, recorded in sediments as the proportion of silt, was at a maximum around 3.0-3.3 Ma then gradually decreased until 0.5 Ma. In the upper Pleistocene, maxima in diatom percentage are assumed to occur during interglacials, implying reduced sea-ice cover; maxima in silt percentage correspond to diatom maxima, implying stronger bottom water flow during interglacials. (Auth.)

E-44373

Grobe, H., Fütterer, D.K., Spiess, V., **Oligocene to Quaternary sedimentation processes on the antarctic continental margin, ODP Leg 113, Site 693**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.121-131, Refs. p.129-131.

DLC QE39.T49b

Oligocene to Quaternary sediments were recovered from the antarctic continental margin in the eastern Weddell sea. During the middle Oligocene, increasing glacial conditions on the continent are indicated by the presence of glauconitic sands, that are interpreted to have formed on the shelf and then transported down the continental slope by advancing glaciers or as a result of sea-level lowering. The dominance of illite and a relatively high content of chlorite suggest predominantly physical weathering conditions on the continent. The high content of biogenic opal from the late Miocene to the late Pliocene resulted from increased upwelling processes at the continental margin due to increased wind strength related to global cooling. Partial melting of the ice-sheet occurred during an early Pliocene climate optimum, as is shown by an increasing supply of predominantly current-derived sediment with a low mean grain size and peak values of smectite. Primary productivity decreased at about 3 Ma due to the development of a permanent sea-ice cover close to the continent. Isotopic analysis of *N. pachyderma* produced a stratigraphy which resulted in a calculated sedimentation rate of 1 cm/k.y. during the Pleistocene. Primary productivity was highest during the last three interglacial maxima and decreased during glacial episodes as a result of increasing sea-ice coverage. (Auth. mod.)

E-44374

Egeberg, P.K., Aagaard, P., Smalley, P.C., **Major element and oxygen isotope studies of interstitial waters: ODP Leg 113**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.135-146, 34 refs.

DLC QE39.T49b

Variations in the distribution of major elements and stable oxygen isotopes in ODP Leg 113 pore water are not related to lithology and

thus appear to be controlled by minor constituents. Petrographic observations and geochemical considerations indicate that alteration of calc-alkalic volcanic material dispersed in the sediment is an important process. A diagenetic reaction is constructed that involves transformation of volcanic glass into smectite, zeolite (represented by phillipsite), chert, and iron sulfide. Mass balance calculations reveal that alteration of less than 10% (volume) of volcanogenic material may account for the observed depletion of magnesium, potassium, and O-18 and enrichment of calcium. Alteration of this amount of volcanic glass produces less than 4% (volume) of smectite and zeolite. Hence, mass balance is obtained without having to invoke unreasonably large amounts of volcanic matter or interactions between seawater and basement. (Auth.)

E-44375

Egeberg, P.K., Smalley, P.C., Aagaard, P., **Strontium isotope geochemistry of Leg 113 interstitial waters and carbonates**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.147-157, 25 refs.

DLC QE39.T49b

The concentration of dissolved Sr and the distribution of Sr-87/Sr-86 isotope ratios in Leg 113 interstitial waters may be interpreted in terms of mixing of Sr from four different reservoirs: indigenous seawater, marine carbonate minerals, and basaltic and siliceous detrital material. The input to the pore water from these reservoirs is determined by the reactivity of the reservoir rather than its size. The presence of strontium derived from siliceous detrital material is unequivocally demonstrated in the pore waters of the hemipelagic deposits, and is also significant in the calcareous Maud Rise sediments due to the unusually low degree of carbonate recrystallization. Also, alteration of basic volcanic material is important at several sites. (Auth.)

E-44376

Michel, H.V., Asaro, F., Alvarez, W., Alvarez, L.W., **Geochemical studies of the Cretaceous-Tertiary boundary in ODP Holes 689B and 690C**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.159-168, 9 refs.

DLC QE39.T49b

In a study of ODP Hole 689B no iridium (Ir) anomaly was found in Sections 1 through 6 of Core 25X or in Core 26X from the top down to section 2, 3-13 cm. If the Cretaceous-Tertiary (K-T) contact is in the region studied, then sedimentation was not continuous, and the K-T boundary was probably either not deposited or it was eroded away. In a study of Cores 15X and 16X of ODP Hole 690C, an iridium peak with a maximum abundance of 1566 ppt was found in Section 4 of Core 15X at 39-40 cm with a half-width of 6.6 cm. The Ir distribution below the main peak is attributed to bioturbation by organisms with burrows extending at least 0.4 m. There are variable enrichments of clay in the mainly CaCO₃ sediment of core 15X, and the stratigraphically lowest part of the most abundant clay deposits is found (within 2 cm) in the same position as the main Ir peak. The degree of homogeneity of the clay-rich interval suggests it was not due to episodic volcanism but may have been due to a decrease of the CaCO₃ deposition rate which was possibly triggered by the impact of a large asteroid or comet on the Earth. (Auth. mod.)

E-44379

Thompson, K.F.M., Dow, W.G., **Investigation of Cretaceous and Tertiary kerogens in sediments of the Weddell Sea**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.189-197, 21 refs.

DLC QE39.T49b

Seventy-one samples from nine sites were analyzed for total organic carbon (TOC). Fifty-six samples, containing 0.2% or more TOC, were evaluated by Rock-Eval to assess the nature of their kerogen and its petroleum source potential. Visual kerogen studies were carried out. Petroleum potential was encountered only in Valanginian calcareous claystones at Hole 692B close to the margin of Dronning Maud Land. A section of 44.7 m was penetrated. The unit possesses a revised mean TOC of 9.8% and petroleum potential of 43.2 kg/Mg, relatively high values in comparison to other Cretaceous anoxic oceanic sections and the totality of petroleum source rocks. At Sites 689 and 690, extremely low TOC levels, mean 0.07%, preclude kerogen analysis. Kerogens in Eocene to Pleiocene sediments of the central and western Weddell Sea (Sites 694, 695, 696, and 697) are similar everywhere, largely comprising brown to black granular amorphous material of high rank, and generally possessing several reflectance populations of vitrinite particles. The latter are interpreted as indicative of the recycling of sediments of a variety of levels of thermal maturity. (Auth.)

E-44380

Kvenvolden, K.A., Hostettler, F.D., Frank, T.J., **Hydrocarbons in sediment of the Weddell Sea, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.199-208, Refs. p.207-208.

DLC QE39.T49b

Heavy hydrocarbons (about C₁₅+) are ubiquitous but minor components in sediment from three sites (692, 693, and 694) drilled during Ocean Drilling Program (ODP) Leg 113. This preliminary report is the first to describe the distribution of some of these hydrocarbons in sediment of the Weddell Sea. Samples from Sites 692 and 693, located on a mid-slope bench along the margin of Queen Maud Land, span a time interval from Early Cretaceous to Pleistocene. In samples from the Tertiary portion of the record, having an average organic-carbon content of about 0.2%, *n*-alkanes are common and are characterized by populations that indicate both marine and terrigenous sources. In contrast, samples from the Cretaceous portion of the record, having an average organic carbon content of about 4%, contain mixtures of hydrocarbons in which *n*-alkanes are secondary in abundance to the isoprenoid hydrocarbons, pristane and phytane. Diasterenes, sterenes, and hopenes are present in anomalously high concentrations and indicate immaturity. The Cretaceous hydrocarbons appear to be mainly primary, whereas the Tertiary hydrocarbons contain compounds which indicate that the sediment, along with its organic content, has been recycled. Samples from Site 694, located in the Weddell Sea on the abyssal plain, range in age from late Miocene to early Pliocene. (Auth. mod.)

E-44381

Bryant, W.R., Rack, F.R., **Consolidation characteristics of Weddell Sea sediments: results of ODP Leg 113**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.211-223, 19 refs.

DLC QE39.T49b

Examination of the geotechnical characteristics of Weddell Sea, Maud Rise, and South Orkney microcontinental margin sediments recovered during ODP Leg 113 reveals that the reduction in porosity (consolidation) of the siliciclastic, calcareous, and diatomaceous sediments is primarily a process governed by vertical stresses created by overburden. The initial porosity of the sediments in these areas is governed by the amount of diatoms present. The more diatoms, the higher the porosity. Surficial diatom-rich sediments are everywhere overconsolidated. This is attributed to the strong microfabric created by the diatoms, calcareous and clay particles. The deeper diatom-free sediments of Maud Rise range from slightly underconsolidated to normally consolidated. The silty clays and clays of the Weddell Sea and South Orkney margin are underconsolidated. The degree of underconsolidation of these sediments is similar to that determined in a number of different locations throughout the world's oceans. The very low permeability of the Weddell Sea and South Orkney margin sediments appears to account for this underconsolidation. (Auth.)

E-44382

Bryant, W.R., Bennett, R.H., Burkett, P.J., Rack, F.R., **Fabric of a consolidating clayey sediment column, ODP Site 697**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.225-237, Refs. p.232-233.

DLC QE39.T49b

Consolidation of sediment is the main cause of porosity reduction with depth in the upper 1000 m of the sediment column. The consolidation of high-porosity sediment is mostly mechanical: the weight of the overlying sediment drives the rearrangement of individual particles and groups of sedimentary particles and domains. The mechanics of particle reorientation may be understood best through an examination of the sediment microfabric. A clay-rich sediment section 318 m thick, recovered during ODP Leg 113 from the South Orkney Microcontinental Margin, Site 697 in the Weddell Sea, was examined by transmission electron microscopy of ultrathin sections. Reorientation of randomly arranged particles of this fine-grained, high-porosity (70-75%) sediment occurs very gradually: porosity decreases to only about 50% at a depth of 318 m, because of the very fine-grained nature of the sediment and the presence of extremely fine-grained smectite, which imparts a very low permeability even at porosities of 50%. (Auth.)

E-44383

Golovchenko, X., O'Connell, S.B., Jarrard, R., **Sedimentary response to paleoclimate from downhole logs at Site 693, antarctic continental margin**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.239-251, 24 refs.

DLC QE39.T49b

The first well logs collected below the antarctic circle were obtained during Leg 113 at Site 693 on the Queen Maud Land Margin in the Weddell Sea. Gamma-ray, resistivity, and sonic logs were collected between 108.0 and 439.0 mbsf. The downhole logs show good agreement with the data collected from cores and provide a continuous measurement of the sedimentary record. These continuous log records show that the rather uniform Tertiary lithology seen in cores is characterized by high-frequency variability in the log data. Several thin hard streaks are identified, the largest of which coincides with a major Miocene hiatus. Associated with this hiatus is a change to lower illite content (and correspondingly lower gamma-ray counts) and to a significant increase in diatom content. Spectral analysis of the logs was performed on the lower Pliocene through upper Oligocene interval (108.0-343.0 mbsf). Although variations in diatom

abundance were observed in the cores, they were not attributed to a Milankovitch signal, and therefore in this environment, downhole logs are an important contribution to the detection and understanding of orbitally influenced changes in sedimentation. (Auth. mod.)

E-44389

Gersonde, R., Harwood, D.M., **Lower Cretaceous diatoms from ODP Leg 113 Site 693 (Weddell Sea). Part 1: vegetative cells**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.365-402, Refs. p.382-383.

DLC QE39.T49b

Exceptionally well preserved nearshore shallow water diatom assemblages of late Aptian to early Albian age (115-110 Ma) are described. These assemblages are significant because they allow insights into phylogenetic relationships during the little-known early evolution of diatoms and the status of diatom evolution by the Early Cretaceous. This contribution focuses on the diatom vegetative cells. A total of 12 new genera, 22 new species, 4 new varieties, and 1 new forma are described, and 5 new combinations are proposed. The genus *Gladius* Forti and Schultz (1932), including the species *G. antiquus*, is redescribed and taxa belonging to its later homonym *Gladius* Schultz (1935) are transferred to the new genus *Gladiopsis*. Valve characteristics of many of the described Lower Cretaceous taxa are: a radial poroid basal layer; pseudoloculate wall; and the presence of a well developed apical linking apparatus, consisting of one or more three-buttressed linking spines and corresponding sockets. Taxa of six genera, which lack such an apical linking apparatus or have only rudimentary linking spines, bear structures that are interpreted to represent processes. Five different types of processes are described that probably represent early stages of the modern labiate process and the strutted process. Thus, one prominent characteristic of the observed late Early Cretaceous diatoms is their chain forming ability. (Auth. mod.)

E-44390

Harwood, D.M., Gersonde, R., **Lower Cretaceous diatoms from ODP Leg 113 Site 693 (Weddell Sea). Part 2: resting spores, Chrysophycean cysts, an endoskeletal dinoflagellate, and notes on the origin of diatoms**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.403-425, Refs. p.413-414.

DLC QE39.T49b

This chapter describes and illustrates Lower Cretaceous diatom resting spores, Chrysophycean cysts, and an endoskeletal dinoflagellate from Holes 693A and 693B. Six new diatom genera and 20 new species of probable diatom resting spores are presented here, in addition to 10 apparently new Chrysophycean cyst taxa and one endoskeletal dinoflagellate species. Diatom assemblages reported here and in the preceding chapter on vegetative forms (Part 1) suggest that diatoms were a complex, diverse, and widespread group by late Early Cretaceous time; that diversities are high enough to anticipate the construction of a useful biostratigraphic zonation as more data become available; that there is a considerable difference between assemblages in these Albian sediments and younger Senonian diatomites known around the world; that both resting spore formation and the ability to form chains are ancient features of the diatoms; and that diatom distribution in the Early Cretaceous may have been restricted to continental margins and interior seas, areas where resting spore formation is most common. Because these assemblages are the oldest well-preserved diatom and Chrysophycean floras known, this

chapter concludes with a brief review and discussion on the origin of the diatoms, addressing both the role of resting spores and postulated links to Chrysophycean flagellates. (Auth. mod.)

E-44391

McCartney, K., Wise, S.W., Jr., Harwood, D.M., Gersonde, R., **Enigmatic Lower Albian silicoflagellates from ODP Site 693: progenitors of the order silicoflagellata?**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.427-442, Refs. p.433-434.

DLC QE39.T49b

A rich assemblage of unusual silicoflagellates has been found in Lower Cretaceous (lower Albian) sediments of Ocean Drilling Program Holes 693A and 693B (sections 113-693A-44R-1, -44R, CC, and -693B-19X-4). The morphology of the dominant taxon shows much variability and consists of hollow branching skeletal elements without apical or basal rings. This silicoflagellate is similar in both morphology and variability to specimens hitherto assigned to *Cornua aculeifera* Deflandre, a taxon not previously illustrated from sediments obtained by deep sea drilling. This unusual taxon is assigned to a new silicoflagellate genus, *Variramus*. Two other silicoflagellate species, *Variramus loperi* n.sp. and *Vallacerta hannai* Deflandre, are also present but occur in rare abundance in these sediments. It is suggested that *Variramus aculeifera* is the most primitive form and that it subsequently gave rise to the genera *Lyramula* and *Cornua*. Prior to the development of these two genera, *Variramus loperi*, a species with a polygonal symmetry of basal pikes and a distinct orientation of the skeleton, appeared and probably gave rise to the genus *Vallacerta*. Spine morphology, basal pike orientation, and symmetry considerations suggest a link between *Variramus loperi* and *Vallacerta hannai*. This lower Cretaceous assemblage of *Variramus aculeifera*, *V. loperi*, and *Vallacerta hannai* documented here, may represent the oldest known silicoflagellates. As such, it provides new insight into their early evolutionary development. (Auth.)

E-44392

Doyle, P., Crame, J.A., Thomson, M.R.A., **Late Jurassic-Early Cretaceous macrofossils from Leg 113, Hole 692B, eastern Weddell Sea**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.443-448, Refs. p.446-447.

DLC QE39.T49b

Various macrofossils were recovered from ODP Leg 113 Hole 692B. These are predominantly molluscan and comprise pectinid, oxytomid, and inoceramid bivalves, the inner whorls of a *Spiticeras* (ammonite), and a single belemnite rostrum tentatively assigned to the genus *Hibolithes*. The best preserved and most age-diagnostic elements of this fauna are described. The presence of stromatolitic overgrowths on the belemnite suggests shelf deposition. The age of the fauna, based primarily on the ammonite identification, is Tithonian-Berriasian. (Auth.)

E-44393

Mohr, B.A.R., **Early Cretaceous palynomorphs from ODP Sites 692 and 693, the Weddell Sea, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.449-464, Refs. p.456-457.

DLC QE39.T49b

Detailed descriptions of *in situ* ?Valanginian to Albian antarctic palynofloras are presented from Weddell Sea claystones with high percentages of organic matter ("black shales") and intercalated volcanic ash layers. Palynological investigations of these Cretaceous sediments revealed a ?Valanginian-Hauterivian age for the Site 692 sediments and an Aptian-Albian age for Site 693. This paper is focused on the palynomorphs of Site 692. Miospores, dinoflagellate cysts, and acritarchs are listed and compared with early Cretaceous microfossils from the Antarctic Peninsula, Australia, and South America. The dinocyst assemblage of Site 692 seems to be very similar in composition to an assemblage from the South Shetlands (?Valanginian-Hauterivian-Barremian). According to the Australian miopore zonation schemes, the sporomorph flora from Site 692 belongs to the South Australia *Foraminisporis wonthaggiensis* Zone (early Valanginian to Hauterivian) or the lower part of the dinocyst *Muderongia* Superzone (Valanginian to Hauterivian). (Auth. mod.)

E-44400

Wright, T.O., Dallmeyer, R.D., **Age of cleavage development in the Ross orogen, northern Victoria Land, Antarctica: evidence from Ar-40/Ar-39 whole-rock slate ages**, *Journal of structural geology*, 1991 13(6), p.677-690, Refs. p.686-687.

Metamorphic conditions accompanying regional S1 cleavage development and whole-rock slate Ar-40/Ar-39 age spectra indicate that the Ross orogeny occurred at ca 500 Ma. Subsequent deformation associated with development of a major thrust overprinted the regional cleavage. Existing cleavage micas were not thermally reset and syntectonic mica did not crystallize during thrusting. A regional, low-grade thermal event of Middle Jurassic age may be suggested by the variably discordant age spectra. (Auth.)

E-44411

Naraoka, H., Yanai, K., Fujita, S., **Dirt bands in the bare ice area around the Sör Rondane Mountains in Queen Maud Land, Antarctica**, *Antarctic record*, Mar. 1991 35(1), p.47-55, In Japanese with English summary. 11 refs.

Dirt bands were observed on the surface of the bare ice fields around the Sör Rondane Mountains during the search for antarctic meteorites in 1988-1989. Dirt bands were commonly distributed on the bare ice around the mountains, especially in Nansenisen. Dirt bands were collected and filtered after melting. Microscopic observation revealed that dust materials were composed mainly of volcanic glass shards. Five types of volcanic ash were preliminarily clarified with respect to the colors (black, dark gray, gray, reddish brown and pale gray) and sizes (5-50 microns) of the particles. The EPMA chemical analyses indicated that the volcanic glass shards contained 50-70% SiO₂ and belonged to the non-alkaline region of the SiO₂-(Na₂O+K₂O) diagram. (Auth.)

E-44442

Grantham, G.H., Moyes, A.B., Hunter, D.R., **Age, petrogenesis and emplacement of the Dalmatian Granite, H.U. Sverdrupfjella, Dronning Maud Land, Antarctica**, *Antarctic science*, June 1991 3(2), p.197-204, 30 refs.

The approximately 470 Ma Dalmatian Granite forms sheet-like bodies intruded discordantly into orthogneisses, paragneisses and calcareous rocks belonging to the approximately 1000 Ma Jutulrora, Sveabreen and Fuglefjellet formations respectively. The Dalmatian Granite is muscovite + biotite bearing. Two varieties are recognized, one that is magnetite-bearing and another that is characterized by tourmaline nodules. At some localities, development of the tourmaline-bearing variety is spatially associated with the presence of carbonates. Physical conditions of emplacement for the Dalmatian Granite are estimated to be approximately 700 C and 6kbar with

pH₂O=P(load). The emplacement of the granite is considered to have occurred syntectonically during D3 approximately 470 Ma ago. The granites are therefore similar in age to Pan African age granites in Mozambique as well as Ross Orogeny age granites in the Transantarctic Mountains. (Auth.)

E-44443

Young, D.N., Black, L.P., **U-Pb zircon dating of Proterozoic igneous charnockites from the Mawson Coast, East Antarctica**, *Antarctic science*, June 1991 3(2), p.205-216, Refs. p.215-216.

Ion-microprobe U-Pb zircon ages are reported from charnockites of a large Proterozoic composite batholith on Mawson Coast. The charnockites crystallized from orogenic magmas of intermediate composition intruded into a granulite-facies metasedimentary gneiss sequence between the second and third recognized deformations. A sample of low-Ti charnockite provides an age of 954 Ma and a high-Ti charnockite is dated at 985 Ma. Both these ages were obtained from zircons with igneous zoning and/or morphology and thus are thought to date igneous crystallization. Zircons from a felsic gneiss xenolith within the charnockite have cores of various ages, many from 1.7 to 2.0 Ga, but with other grains between 1.0 and 1.5 Ga and a single 2.5 Ga zircon. These zircon cores are direct evidence for an early to middle Proterozoic age for the supracrustal basement sequence in this mobile belt. Many of these zircon cores are concordant but abundant discordant grains suggest a complex history of multiple Pb-loss events. Zircon rims grew at 921 Ma, probably during the post-charnockite deformation. (Auth. mod.)

E-44444

Larter, R.D., Henriot, J.P., Bialas, J., Meissner, R., **Debate: preliminary results of seismic reflection investigations and associated geophysical studies in the area of the Antarctic Peninsula**, *Antarctic science*, June 1991 3(2), p.217-222, 27 refs.

A debate is presented about a recent paper which described the South Shetland Trench as a "recently de-activated trench" on the evidence of the undisturbed character of the trench-fill sediments, and marine magnetic anomaly identifications which show that spreading has ceased on the Antarctic-Phoenix Ridge. It is argued that neither of these observations supports the hypothesis that the South Shetland Trench is an active subduction zone. In their reply, the authors of the paper discussed expand on the points in question in an effort to show that there is no fundamental contradiction between the two positions.

E-44481

Moores, E.M., **Southwest U.S.-East Antarctic (SWEAT) connection: a hypothesis**, *Geology*, May 1991 19(5), p.425-428, 45 refs.

A hypothesis for a late Precambrian fit of western North America with the Australia-Antarctic shield region permits the extension of many features through Antarctica and into other parts of Gondwana. Specifically, the Grenville orogen may extend around the coast of East Antarctica into India and Australia. The Wopmay orogen of north-west Canada may extend through eastern Australia into Antarctica and thence beneath the ice to connect with the Yavapai-Mazatzal orogens of the southwestern United States. The ophiolitic belt of the latter may extend into East Antarctica. Counterparts of the Precambrian-Paleozoic sedimentary rocks along the U.S. Cordilleran miogeocline may be present in the Transantarctic Mountains. Orogenic belt boundaries provide useful piercing points for Precambrian continental reconstructions. The model implies that Gondwana and Laurentia rifted away from each other on one margin and collided some 300 m.y. later on their opposite margins to form the Appalachians. (Auth.)

E-44482

Sempéré, J.C., Palmer, J., Christie, D.M., Morgan, J.P., Shor, A.N., **Australian-Antarctic discordance**, *Geology*, May 1991 19(5), p.429-432, 36 refs.

The Australian-Antarctic discordance is a region of anomalous geophysical and geochemical properties along the mid-ocean ridge system. It includes the isotopic boundary between Pacific Ocean and Indian Ocean basalts. Its lavas have compositions consistent with low mantle temperatures and a relatively low overall extent of melting. These characteristics have been attributed to downward flow in the underlying mantle. New bathymetric and side-scan sonar data show that (1) the spreading axis within the discordance is predominantly characterized by a broad rift valley and segmentation characteristics typical of slow-spreading centers; (2) the isotopic boundary appears to be associated with unusual chaotic sea floor; and (3) the spreading axis east of the discordance is characterized by an axial ridge typical of fast-spreading centers. These extreme variations, at an essentially constant (intermediate) spreading rate, are consistent with differences in melt supply and mantle properties along the spreading axis within and east of the discordance, as suggested in previous studies. (Auth.)

E-44485

Parra, M., Chapuy, B., Pons, J.C., Latouche, C., **Nature and origin of smectites in the Kerguelen-Heard Archipelagoes of the southern Indian Ocean**, *Continental shelf research*, Apr. 1991 11(4), p.347-364, 43 refs.

The clay phases of the Quaternary volcanics, soils and sediments from the northern part of the Kerguelen-Heard Plateau, southern Indian Ocean, are essentially well-crystallized smectites. The origin of these smectites was studied based on variations in their mineralogy and their different stages of development in the different environments. Two major groups of smectites occur in the hydrothermal alteration products of the Kerguelen I. volcanic formations Mg s.s. and Fe-Mg saponites of the basalts, and Al-Fe and Al beidellites in the other formations. In the soils formed on the volcanic substratum, the well-crystallized smectites are mainly of the Al beidellite type and, secondarily, of the Al-Fe beidellite type. In the Morbihan Gulf sediments, the well-crystallized smectites are dominant and of the Al-Fe and Al beidellite type; these smectites are inherited from the volcanic formations and soils of the Kerguelen Is. In the Quaternary sediments of the Kerguelen-Heard Plateau, the well-crystallized and relatively abundant smectites are of the Mg-rich, Al nontronite type. The absence of related links with the Kerguelen I. smectites, the substantial dissolution of the siliceous tests, the degree of silica saturation of the water context and the occurrence of glauconite, the first stage of formation being a rich-Mg ferriferous smectite, supports the hypothesis of an authigenous origin for these smectites rather than originating by inheritance from the volcanic islands. (Auth.)

E-44487

The Antarctic Meteorite Working Group, **Antarctic meteorites: an international resource for scientific research**, Houston, Lunar and Planetary Institute, 1981, 9p.

Meteorite studies constitute an essential part of space science because meteorites include the oldest solar system materials available for research, and they sample a wide range of parent bodies—some primitive, some highly evolved. They carry decipherable records of certain solar and galactic effects, and yield data otherwise unobtainable about the genesis, evolution, and composition of the Earth and other planets, satellites, asteroids, and the Sun. Meteorites also provide an important body of "ground truth," in a chemical and physical sense, critical to interpreting planetary data obtained by remote sensing. Recent discoveries and areas of interest include: elements, isotopes, and formation of the solar system; meteorite textures; e. t. amino acids; meteorites and asteroids; new types of meteorites; long terrestrial residence times; and the U.S. collection and distribution program. The following represent potential future research projects:

rare and unique meteorite types; organic molecules synthesized in space; isotopes and elements in trace constituents; meteorite changes with time; cosmic ray flux variations; and commercial processing of e. t. materials.

E-44488

Pospichal, J.J., Wise, S.W., Jr., **Maestrichtian calcareous nannofossil biostratigraphy of Maud Rise ODP Leg 113 Sites 689 and 690, Weddell sea**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.465-487, Refs. p.476-477.

DLC QE39.T49b

Recovery of an essentially complete Upper Maestrichtian/Lower Paleocene interval on Maud Rise at 65S latitude marks the first time that this interval has been cored at these high latitudes. Maestrichtian nannofossil assemblages in sediments from Sites 689 and 690 provide the basis for a needed revision of Maestrichtian coccolith zonation schemes for high southern latitudes. Three zones and two new subzones are described: the uppermost Maestrichtian *Nephrolithus frequens* Zone, which is subdivided into the *Cribrosphaerella daniae* Subzone and the underlying *N. corystus* Subzone, and the *Biscutum magnum* and *B. coronum* Zones. A complete calcareous nannofossil biostratigraphy based on the proposed scheme is given, including a description of individual species abundance, preservation, and stratigraphic distribution. At this site, the southernmost carbonate site yet drilled by DSDP/ODP, it is evident that the Falkland Plateau Nannofossil Biogeographic Province can be extended to the margins of Antarctica. In addition, the biogeographic ranges of many calcareous nannofossils can likewise be extended. It is suggested that *Nephrolithus frequens* evolved from *N. corystus* prior to its dispersal to the lower latitudes where it is an important zonal marker. Three new taxa, *Neocrepidolithus watkinsii* n. sp., *Nephrolithus frequens miniporus* emend. n. comb, and *Psyktosphaera firthii* n. gen., n. sp. are described. (Auth. mod.)

E-44489

Huber, B.T., **Maestrichtian planktonic foraminifer biostratigraphy of the Maud Rise (Weddell Sea, Antarctica): ODP Leg 113 Holes 689B and 690C**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.489-513, Refs. p.506-507.

DLC QE39.T49b

The southernmost record of Maestrichtian pelagic carbonate sedimentation was recovered from ODP Leg 113 Holes 689B and 690C, drilled on the Maud Rise in the eastern Weddell Sea. Well preserved and abundant planktonic foraminifers occur throughout Maestrichtian cores from both holes, providing a nearly complete biogeographic and biostratigraphic history of this region. Diversity is low compared to tropical and subtropical assemblages, with a maximum within-sample diversity of 16 planktonic foraminifer species and a diversity total for the Maestrichtian of 24 species. The assemblages are dominated throughout by *Heterohelix*, *Globigerinelloides*, and a new species of *Archaeoglobigerina*, whereas keeled taxa are completely absent from the lower Maestrichtian and rare in the middle through upper Maestrichtian sediments. Three planktonic foraminifer species are described as new and are recognized as being endemic to the Austral Province. These include *Archaeoglobigerina australis* n. sp., *Hedbergella sliteri* n. sp., and *Archaeoglobigerina mateola* n. sp. A new biostratigraphic scheme is proposed for the Antarctic because of the absence of thermophilic planktonic foraminifers used to identify existing low to middle latitude zones. The *Globigerinelloides impensus* Partial Range Zone is defined for the late Campanian-

Maestrichtian, the *Globotruncanella havanensis* Partial Range Zone is redefined for the early to late early Maestrichtian, and the *Abathomphalus mayaroensis* Total Range Zone is recognized. (Auth. mod.)

E-44490

Pospichal, J.J., Wise, S.W., Jr., **Calcareous nannofossils across the K/T boundary, ODP Hole 690C, Maud Rise, Weddell Sea**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.515-532, 34 refs.

DLC QE39.T49b

A biostratigraphically continuous but intensely bioturbated Cretaceous/Tertiary boundary sequence was cored during Ocean Drilling Program (ODP) Leg 113 on Maud Rise in the Weddell Sea. This interval is the first recovered by ODP/DSDP in the South Atlantic sector of the southern ocean, and offers a unique opportunity to study the nannofossil sequences leading up to and beyond the terminal Cretaceous event at a high southern latitude. The K/T boundary lies just within Chron 29R and is placed at ODP Sample 113-690C-15X-4, 41.5 cm. An iridium anomaly was independently noted at about this level as well. Upper Maestrichtian-lower Paleocene sediments consist mostly of light-colored nannofossil chalks. Dark brown sediments at the base of the Danian (Zone CP1a) are characterized by an increased clay content attributed to a drop in calcareous microplankton productivity following the terminal Cretaceous event. Calcareous nannofossils from the boundary interval were divided into three groups for quantitative study. The three groups, "Cretaceous," "Tertiary," and "Survivor," exhibit a sequential change across the boundary with the Cretaceous forms giving way to a Survivor-dominated assemblage beginning at the boundary followed shortly thereafter by the appearance of the Tertiary taxa, *Cruciplacolithus* and *Hornibrookina*. The species, *H. edwardsii*, comprises nearly 50% of the assemblage just above the Zone CP1a/CP1b boundary, an abundance not reported elsewhere at this level. (Auth. mod.)

E-44491

Fütterer, D.K., **Distribution of calcareous dinoflagellates at the Cretaceous-Tertiary boundary of Queen Maud Rise, eastern Weddell Sea, Antarctica (ODP Leg 113)**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.533-548, Refs. p.542-543.

DLC QE39.T49b

The distribution and stratigraphic ranges of upper Maestrichtian to Paleocene calcareous dinoflagellate species ("Calcspheres") which occurred in two Cretaceous/Tertiary (K/T) boundary sections at Queen Maud Rise are described. Four new species of the genus *Orthopithonella* are described: *O. minuta*, *O. aspera*, *O. flora*, and *O. congruens*. A calcareous dinoflagellate mass occurrence, dominated by *Obliquipithonella operculata*, evolves above the K/T boundary in nannofossil Subzone CP1b. This mass occurrence, which accounts for 20-30% of the total sediment, is present throughout the Danian. The stratigraphic distribution of individual calcareous dinoflagellate taxa clearly shows a major change in species composition. Four species, *Obliquipithonella operculata*, *O. parva*, *Orthopithonella minuta*, and *O. flora* first occur in Subzone CP1a and CP1b. All taxa in the uppermost Maestrichtian seem to become extinct at the base of nannofossil Subzone CP1a or immediately above the K/T boundary in Subzone CP1b. There is apparently no taxon continuing from the uppermost Maestrichtian to the upper Paleocene. Data of calcareous dinoflagellate evolution and distribution at ODP Site 690 suggest that the extinction of Cretaceous and the evolution of Cenozoic taxa at the Cretaceous/Tertiary transition were caused by one event, even

though some of the Cretaceous taxa, such as *Orthopithonella gustafsonii*, became extinct gradually. (Auth. mod.)

E-44492

Stott, L.D., Kennett, J.P., **Antarctic Paleogene planktonic foraminifer biostratigraphy: ODP Leg 113, Sites 689 and 690**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.549-569, Refs. p.561-562.

DLC QE39.T49b

ODP Leg 113 drilled the first nearly continuous pre-Neogene calcareous biogenic sequence from the Antarctic Ocean at Sites 689 and 690. At 65S, these are probably the highest latitude calcareous sequences available in the Southern Hemisphere deep oceans. Together these two sites provide a nearly complete planktonic foraminifer history for the Late Cretaceous through late Oligocene. Planktonic foraminifers are abundant and generally well preserved from the Upper Cretaceous to the Eocene. Abundances and the quality of preservation are reduced during the Oligocene as calcareous microfossil groups are progressively replaced by siliceous groups. The Neogene is marked by only rare, isolated occurrences of planktonic foraminifers, the most conspicuous of which are of Quaternary age. The diversity increased during the late Paleocene through evolutionary radiation in conjunction with warm conditions at high latitudes. Diversity remained high in the Antarctic throughout most of the early and early middle Eocene. Further reduction in diversity occurred across the Eocene/Oligocene boundary in response to continued cooling and increased CaCO₃ dissolution. At that time siliceous microfossils began to appear in increasing abundance. A new planktonic foraminifer biostratigraphy has been developed for the Weddell Sea area. Fourteen biozones are defined on the basis of distinct biohorizons used to mark the top and bottom of each zone, and are intercalibrated with magnetostratigraphy. This stratigraphy has been correlated with the well-established low-latitude zonations. (Auth. mod.)

E-44498

Abelmann, A., **Oligocene to Middle Miocene radiolarian stratigraphy of southern high latitudes from Leg 113, Sites 689 and 690, Maud Rise**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.675-708, Refs. p.698-699.

DLC QE39.T49b

At Sites 689 and 690, moderately to well preserved radiolarian assemblages were obtained from continuously recovered upper Oligocene and Neogene sequences. Based on radiolarian investigations, a biostratigraphic zonation for a time interval covering the late Oligocene to the middle Miocene is proposed. The radiolarian zonation comprises 10 zones. Five zones are new, and five zones previously defined by Chen (1975) were modified. The zones and the ranges of the nominate species are directly calibrated with a geomagnetic polarity record. This is the first attempt at a direct correlation of late Oligocene to middle Miocene radiolarian zones with the geomagnetic time scale. Six hiatuses were delineated in the studied upper Oligocene to middle Miocene sections. One major hiatus, spanning ca. 6 m.y., is between the upper Oligocene and the lower Miocene sequences. Another important hiatus separates the lower and middle Miocene sediments. As a base for the biostratigraphic investigations, a detailed taxonomic study of the recovered radiolarian taxa is achieved. Three new radiolarian species that occur in upper Oligocene and lower Miocene sediments are described (*Cycladophora antiqua*, *Cyrtocapsella robusta*, and *Velicucullus altus*). (Auth.)

E-44499

Lazarus, D., **Middle Miocene to Recent radiolarians from the Weddell Sea, Antarctica, ODP Leg 113**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.709-727, Refs. p.718-720.

DLC QE39.T49b

Well preserved middle Miocene to Recent radiolarians were recovered from several sites in the Weddell Sea by ODP (Ocean Drilling Program) Leg 113. Low rates of sedimentation, hiatuses, and poor core recovery in some sites are offset by the nearly complete recovery of a late middle Miocene to late Pliocene section at Site 689 on the Maud Rise. Although a hiatus within the latest Miocene exists, this site still provides an excellent reference section for antarctic biostratigraphy. A detailed radiolarian stratigraphy for the middle Miocene to late Pliocene of Site 689 is given, together with supplemental stratigraphic data from ODP Leg 113 Sites 690, 693, 695, 696, and 697. A refined antarctic zonation for the middle Miocene to Recent is presented, based on the previous zonations of Hays (1965), Chen (1975), Weaver (1976b), and Keany (1979). The late Miocene radiolarian *Acrosphaera australis* n. p. is described and used to define the *A. australis* zone, ranging from the first appearance of the nominate species to the last appearance of *Cycladophora spongothorax* (Chen) Lombardi and Lazarus 1988. The species *Botryopera deflandrei* Petrushevskaya 1975 is transferred to *Antarctissa deflandrei* (Petrushevskaya) n. comb. (Auth.)

E-44500

McCartney, K., Wise, S.W., Jr., **Cenozoic silicoflagellates and ebridians from ODP Leg 113: biostratigraphy and notes on morphologic variability**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.729-760, Refs. p.751-753.

DLC QE39.T49b

Silicoflagellates are present at ODP 113 Sites 689, 690, 693, 695, 696, and 697. These are generally Neogene in age except for Oligocene and Eocene silicoflagellates and ebridians at Sites 689, 690, and 693, and Lower Cretaceous (Albian) silicoflagellates at Site 693. The uppermost Miocene-lowermost Pliocene of most sites contains an interesting assemblage of *Distephanus speculum speculum* that lack apical rings (the *pseudofibula plexus*). These co-occur with the youngest ice-rafted sediments deposited during the late Miocene-early Pliocene West Antarctic glaciations and are discussed in detail to show the variability within this group. It is suggested that these variations resulted from environmental stress, the precise nature of which is still undetermined. The *pseudofibulid* condition has developed at several different times during the Cenozoic within the *Distephanus speculum* lineage to produce such ecophenotypes. One new form from the *pseudofibula plexus*, *D. s. speculum f. pseudopentagonus*, is described. (Auth.)

E-44501

Gersonde, R., Burckle, L.H., **Neogene diatom biostratigraphy of ODP Leg 113, Weddell Sea (Antarctic Ocean)**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.761-789, Refs. p.782-783.

DLC QE39.T49b

Diatom assemblages recovered during ODP Leg 113 at 8 sites in the Weddell Sea provide new insights into southern high-latitude Neogene diatom biostratigraphy. The excellent sections recovered by ODP Leg 113 Sites 689 and 690 (Maud Rise) were chosen for the

establishment of a revised Neogene antarctic diatom zonation. Altogether, 16 diatom zones are described as well as several stratigraphically useful diatom datums of late early Miocene to Pleistocene age. Six zones established by previous authors are partly modified or renamed, and 10 new zones are proposed. The zones are calibrated directly to the geomagnetic time scale, which provides a chronological framework for the zones and permits comparisons of Neogene antarctic diatom events with events described from the low and northern high latitudes. (Auth. mod.)

E-44502

Gersonde, R., **Taxonomy and morphostructure of Neogene diatoms from the southern ocean, ODP Leg 113**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.791-802, Refs. p.795-796.

DLC QE39.T49b

Selected Neogene and Quaternary diatom taxa of the genera *Actinocyclus*, *Asteromphalus*, and *Thalassiosira* that were recovered in ODP Leg 113 drillholes are described and discussed based on light and scanning electron microscope observations. Some of these diatoms are useful stratigraphic markers or indicators for paleoceanographic reconstructions. Their stratigraphic range and abundance pattern in the southern high-latitudes is described and compared to their ranges in low- and northern high-latitudes, and their significance for paleoceanographic reconstructions is briefly discussed. Two new *Asteromphalus* species and the new variety *Actinocyclus ingens* var. *ovalis* are described, and *Coscinodiscus kolbei* Jousé is transferred to the genus *Thalassiosira*. (Auth.)

E-44503

Burckle, L.H., Gersonde, R., Abrams, N., **Late Pliocene-Pleistocene paleoclimate in the Jane Basin region: ODP Site 697**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.803-809, 38 refs.

DLC QE39.T49b

Diatom preservation patterns in Pliocene age sediments of Jane Basin were examined and compared with diatom distribution in more northerly sites at various sectors of the southern ocean. All data support the view that there was significant ice growth on Antarctica during the late Pliocene. DSDP Site 514 in the Atlantic sector shows increased relative abundance of *Eucampia antarctica*, an ice-related form, in the upper part of the Gauss Chron with a larger increase just above it. With one exception, all sites included in the present study show increased relative abundance of *E. antarctica* in the upper part of the Gauss. The view that there was ice growth on Antarctica during the late Gauss Chron is supported by the results from ODP Site 697. While diatoms are present and percent opal is high in the early and middle Gauss Chron (suggesting more open-ocean conditions), late Gauss sediments contain low percentages of opal and few or no diatoms. This is also true for the early Matuyama Chron. The absence of diatoms and the low percentages of opal in middle and late Matuyama Chron sediments suggests increased sea-ice cover over the Jane Basin during this time. Although warmer open-ocean intervals are inferred for intervals near the Olduvai and Jaramillo Subchrons, most of the Matuyama Chron was marked by extensive sea-ice cover with low seasonal contrast. Results for the early part of the Brunhes Chron are similar, at least for the Jane Basin. During this time, sea-ice cover over the basin apparently extended well into the growing season. In contrast, the later Brunhes Chron is marked by alternating open water (during the growing season) and extensive, almost year-round, sea-ice. (Auth. mod.)

E-44505

Stott, L.D., Kennett, J.P., **Paleoceanographic and paleoclimatic signature of the Cretaceous/Paleogene boundary in the Antarctic: stable isotopic results from ODP Leg 113**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.829-848, Refs. p.845-846.

DLC QE39.T49b

Stable isotopic records across the Cretaceous/Paleogene (K/P) boundary in Maud Rise Holes 689B and 690C indicate that significant climatic changes occurred during the latest Cretaceous, beginning approximately 500 k.y. prior to the mass extinction event and the enrichment of iridium at the K/P boundary (66.4 Ma). An oxygen isotopic decrease of 0.7-1.0 per mill is recorded in the Late Cretaceous planktonic and benthic foraminifers between 66.9 and 66.6 Ma. The negative isotope excursion was followed by a positive excursion of similar magnitude between 66.6 Ma (latest Cretaceous) and 66.3 Ma (earliest Paleocene). No other isotopic excursions of this magnitude are recorded in the planktonic and benthic microfossil records 1.0 m.y. prior to, and for 2.0 m.y. following the mass extinction event at the K/P boundary. The magnitude and duration of these isotopic excursions were similar to those at the Paleocene/Eocene and Eocene/Oligocene boundaries. Any model that attempts to explain the demise of the oceanic plankton at the end of the Cretaceous should consider the oceanic environmental changes that were occurring prior to the massive extinction event. (Auth. mod.)

E-44508

Macko, S.A., Pereira, C.P.G., **Neogene paleoclimate development of the antarctic Weddell Sea region: organic geochemistry**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.881-897, Refs. p.892-893.

DLC QE39.T49b

Stable carbon and nitrogen isotopic compositions as well as organic carbon and total nitrogen contents of cored material are reported for the Weddell Sea, Sites 689 and 690 (Maud Rise), Site 693 (continental margin), and Site 694 (abyssal plain). Results from both high resolution sampling and low resolution are documented. In general, these results indicate large changes in the types and amounts of carbon and nitrogen preserved in the sediments of the Weddell Sea region during the past 25 m.y., with an especially important and dramatic event coinciding with the western antarctic ice-sheet becoming a semi-permanent or permanent feature about 5 Ma. The overall results may be correlated with the onset of major ice-sheets on West Antarctica, stabilization of the ice-sheet in the Pliocene and the intensified recycling of organic carbon and total nitrogen, which is possibly the result of increased ice cover. Evidence is also presented for either low production of organic carbon or the presence of a water column in the eastern Weddell Sea during the early and middle Neogene, which was highly corrosive to organic matter. This condition, together with slow sediment accumulation rates, inhibited the preservation of carbon in the sediments. (Auth.)

E-44509

Thomas, E., **Upper Cretaceous-Paleogene stratigraphy of Sites 689 and 690, Maud Rise (Antarctica)**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.901-914, 28 refs.

DLC QE39.T49b

This contribution summarizes the biostratigraphy of planktonic foraminifers, calcareous nannofossils, and benthic foraminifers, in combination with the magnetostratigraphy, carbon and oxygen isotope stratigraphy of benthic foraminifers, and CaCO₃ stratigraphy for the Maestrichtian through Paleogene calcareous sequences recovered at Sites 689 and 690 on Maud Rise. These data represent the southernmost calcium-carbonate record available for that interval, and thus extend the biostratigraphic and isotopic database to higher latitudes. Sites 689 and 690 form the southernmost anchor of a north-south transect through the Atlantic Ocean for Paleogene biostratigraphy and chemostratigraphy. (Auth.)

E-44510

Gersonde, R., **Biostratigraphic synthesis of Neogene siliceous microfossils from the antarctic ocean, ODP Leg 113 (Weddell Sea)**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.915-936, 18 refs.

DLC QE39.T49b

This paper summarizes the magnetostratigraphic and biostratigraphic results obtained with siliceous microfossils (diatoms, radiolarians, silicoflagellates) on Neogene sections recovered in the Weddell Sea during Ocean Drilling Program Leg 113 (sites 689, 690, 693, 694, 695, 696 and 697). The biostratigraphic studies resulted in the establishment of an improved and revised Neogene biosiliceous zonation for the Antarctic Ocean. The zones are calibrated directly to the geomagnetic time scale. This is the first attempt at direct calibration of Miocene antarctic biostratigraphic zones with the geomagnetic time scale. (Auth.)

E-44511

Kennett, J.P., Barker, P.F., **Latest Cretaceous to Cenozoic climate and oceanographic developments in the Weddell Sea, Antarctica: an ocean-drilling perspective**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.937-960, Refs. p.957-960.

DLC QE39.T49b

This is a summary of principal findings made by ODP Leg 113 investigators concerning the latest Cretaceous-Cenozoic climatic, cryospheric and oceanographic history, and biogeographic developments of the Weddell Sea region. Twenty-two holes were drilled at 9 sites that sampled 4 contrasting environments. A wide range of sedimentologic, biotic, and isotopic evidence obtained in Leg 113 material indicates that sequential cooling and cryospheric development of Antarctica and the surrounding oceans during the Cenozoic profoundly affected the ocean/atmosphere circulation, sediments, and biota. Important cooling steps occurred during the latest Cretaceous, the middle Eocene, near the Eocene/Oligocene boundary, in the middle Oligocene, the middle Miocene, the early late Miocene, the latest Miocene, and the late Pliocene. Distinct but temporary warming trends occurred during the late Paleocene and the latest Oligocene to early Miocene. (Auth. mod.)

E-44513

O'Connell, S.B., **Variations in Upper Cretaceous and Cenozoic calcium carbonate percentages, Maud Rise, Weddell Sea, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.971-984, 11 refs.

DLC QE39.T49b

An almost continuous Upper Cretaceous through Pleistocene biogenic sediment section was recovered from two sites on Maud Rise, a volcanic edifice in the Weddell Sea. Calcium carbonate values were determined for 1100 closely spaced samples using a Coulometrics CO₂ Coulometer. Following a very brief decrease in the percentage of calcium carbonate immediately above the Cretaceous/Tertiary boundary, values remain high (70-80%) throughout most of the Paleocene, with variations primarily attributed to changes in the relative abundance of terrigenous and biogenic components. A small general decrease in calcium carbonate is observed from the upper Paleocene to lower middle Eocene. Eocene values continue to show small to moderate fluctuations. These fluctuations become more pronounced in the Oligocene as biosiliceous and carbonate sediments are mixed and interlayered. A distinct decrease in the calcium carbonate component is observed in the upper Oligocene through lower middle Miocene. Calcium carbonate becomes dominant again in the middle and lower upper Miocene, followed by almost exclusive biosiliceous sedimentation until the Pleistocene, where foraminifer-dominated calcareous ooze was recovered. (Auth. mod.)

E-44514

Shackleton, N.J., Hall, M.A., **Carbon isotope stratigraphy of bulk sediments, ODP Sites 689 and 690, Maud Rise, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.985-989, 8 refs.

DLC QE39.T49b

Carbon isotope measurements were made on bulk sediments from the well-preserved calcareous sequences recovered at ODP Sites 689 and 690 on the Maud Rise, Weddell Sea. The very positive $\delta C-13$ values that characterize the late Paleocene and the rapid trend toward lighter values in the early Eocene established in other sites are clearly recorded here, and may be of value for long-distance stratigraphic correlation. However, values in the late Eocene are significantly more positive than have been reported from other areas. The general pattern of the records from Sites 689 and 690 is sufficiently unlike those previously reported from lower latitudes that it is suggested that carbon isotope data should be used only with considerable caution for correlating sequences from such high latitudes with lower latitude records. (Auth.)

E-44518

Yao, X.L., Taylor, T.N., Taylor, E.L., **Silicified dipterid ferns from the Jurassic of Antarctica**, *Review of palaeobotany and palynology*, 1991 Vol.67, p.353-362, 25 refs.

Petioles with lamina bearing sori have been discovered in silicified blocks collected from early Middle Jurassic rocks in the Queen Alexandra Range of Antarctica. The slightly flattened petioles measure 2.5-4.0 mm in diameter and contain vascular strands arranged in two groups. Exindusiate sori interspersed with paraphyses are randomly arranged on the abaxial surface. Sporangia are stalked and possess a slightly oblique annulus. Spores appear to be monolet. The specimens appear to have their closest affinities with dipterid ferns and represent the first permineralized fern remains recovered from Jurassic sediments in Antarctica. (Auth.)

E-44519

Behrendt, J.C., Cooper, A., **Evidence of a rapid Cenozoic uplift of the shoulder escarpment of the Cenozoic west antarctic rift system and a speculation on possible climate forcing**, *Geology*, Apr. 1991 19(4), p.315-319, 58 refs.

The Cenozoic West Antarctic rift system, characterized by Cenozoic bimodal alkalic volcanic rocks, extends over a largely ice-cov-

ered area, from the Ross Sea nearly to the Bellingshausen Sea. Various lines of evidence, no one of which is independently conclusive, lead to this interpretation. The Transantarctic Mountains part of the rift shoulder (and probably the entire shoulder) has been rising since about 60 Ma, at episodic rates of 1 km/m.y., most recently since mid-Pliocene time, rather than continuously at the mean rate of 100 m/m.y. Uplift rates vary along the scarp, which is cut by transverse faults. It is speculated that this uplift may have climatically forced the advance of the antarctic ice sheet since the most recent warm period. This suggests a possible synergistic relation between episodic tectonism, mountain uplift, and volcanism in the Cenozoic West Antarctic rift system and waxing and waning of the antarctic ice sheet beginning about earliest Oligocene time. (Auth. mod.)

E-44521

Meyer-Berthaud, B., Taylor, T.N., **Probable conifer with podocarpacean affinities from the Triassic of Antarctica**, *Review of palaeobotany and palynology*, 1991 Vol.67, p.179-198, 44 refs.

Notophytum krauselii gen. et sp. nov. occurs in silicified peat of early Middle Triassic age from the Fremouw Peak site in Antarctica. The taxon is based on anatomically preserved stems and roots that range from several millimeters to more than 20 cm in diameter. Secondary xylem shows conspicuous growth rings. Pitting on the radial walls of the tracheids has both abietinean and araucarian characters. Rays are low and uniseriate. One to four large, simple or slightly bordered pits are present in the cross fields. Axial parenchyma may be present. Fibers are present in the secondary phloem of the stems and secretory cells and canals occur in the cortex of young stems. A bijugate arrangement of the leaves occurs in some specimens. Leaf traces arise singly from an axial sympodium and divide at higher levels in the cortex. The presence of numerous closely spaced branches suggests that branching was profuse. Comparisons are made with living and fossil representatives of the Cycadophyta, Ginkgophyta, Pteridospermophyta and Coniferophyta. Similarities with fossil and extant members of the Podocarpaceae are underscored. (Auth.)

E-44522

White, J.F., Jr., Taylor, T.N., **Fungal sporocarps from Triassic peat deposits in Antarctica**, *Review of palaeobotany and palynology*, 1991 Vol.67, p.229-236, 18 refs.

Several different fossil fungi are described from silicified peat deposits collected in Antarctica. Some are characterized by the presence of an interwoven hyphal wall layer surrounding a central cavity devoid of contents. Others show an outer wall layer which is composed of isodiametric cells and a thin acellular inner layer which surrounds membranous sacs or globose spores. The structures of these fossils are interpreted and potential relationships discussed. (Auth.)

E-44535

Horn Filho, N.O., Ayup-Zouain, R.N., **Geomorphologic and sedimentologic aspects of Stinker Point beaches, Elephant Island, Antarctica** [Aspectos geomorfológicos y sedimentológicos de las playas de Stinker Point, isla Elefante, Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1991 No.41, p.115-127, Bachi, F.A., In Spanish with English summary. 12 refs.

The main morphologic moulders of the beaches of Stinker Point are represented by glacial, marine, aeolian and fluvial agents, establishing a sedimentary balance with alterations of erosive and depositional stages. The marine reworking on glacial sediments and gravitational deposits has contributed to the formation of "terraces", with a gentle inclination toward the higher ground and flat surfaces, and the

presence of beach cusps, and rounded and well selected gravel. Textural and morphologic homogeneity is observed in the beach profile, which is evidence of marine activity. (Auth. mod.)

E-44536

Pereira, M., **Note on K-Ar ages of plutonites from the Gerlache Strait, Antarctic Peninsula** [Nota sobre edades K-Ar de plutonitas del estrecho de Gerlache, península Antártica], *Santiago de Chile. Instituto Antártico Chileno. Serie científica*, 1991 No.41, p.129-131, In Spanish. 5 refs.

Results are discussed, and presented in a table, of radio isotopic dating of plutonic rocks covering the southern sector of the Gerlache Strait. A review of results obtained by some authors indicates an eastern direction of the age increase in plutonic rocks of this region. These results are unexpected, since the oldest plutonic rocks of the Pacific with American border, considered to be an extension of the Gerlache Strait, are found in a more westerly location.

E-44540

Schmidt, R., Mäusbacher, R., Müller, J., **Holocene diatom flora and stratigraphy from sediment cores of two antarctic lakes (King George Island)**, *Journal of paleolimnology*, 1990 3(1), p.55-74, 77 refs.

The diatom stratigraphy of Holocene sediment cores from two antarctic lakes of King George I. was investigated. The diatom assemblages were dominated by cosmopolitan species. The flora was composed of three main components: taxa of submersed bryophytic habitats, which also occur in the bryophilic diatom flora of southern South America; species of various terrestrial habitats, including some specific subantarctic taxa; and species distributed in coastal inland waters influenced by sea-spray. Changes in sediment pattern and diatom species composition seemed to reflect climatic changes. At least three different core sections were distinguished in both lakes. Two sections rich in mosses occur between approximately 7000-4700 B.P. and from 3200 B.P. to present, in general resembling present day conditions. In between is a section of high allochthonous content with generally low diatom concentrations and rising percentages of aerophilic, halophilic and alkaliphilic diatoms. An increase of melt water discharge, possible sea-spray influence, and lake-level fluctuations are discussed. Three new taxa are described: *Achnanthes metakryophila* nov. spec., *Achnanthes renei* nov. spec., *Navicula australomediocris* nov. spec. The taxonomy of selected taxa is discussed. (Auth.)

E-44542

Richter, W., **Meltwater and lakes in polar wastelands; on the hydrogeography of the Schirmacher Oasis, East Antarctica** [Schmelzwasser und Seen in der Polarwüste; zur Hydrogeographie der Schirmacheroase, Ostantarktika], *Geographische Rundschau*, June 1991 43(6), p.367-373, In German. 17 refs.

An overview is presented of the ice-free areas and unfrozen lakes of Antarctica, predominantly in East Antarctica, but existing in most coastal regions of the continent. Characteristics of the geologic structures of nearby features are pointed out and their interrelationship with the ice free portions are discussed.

E-44551

St. John, B., ed, **Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards**, AAPG Studies in geology, No.31, Tulsa, OK, American Association of Petroleum Geologists, 1990, 154p. + charts, For individual papers see E-44552, E-44555 through E-44559, E-44561, F-44554, J-44553 and J-44560.

DLC TN870.5.A63 1990

The Symposium on Antarctica, presented at the 1987 annual meeting of the American Association of Petroleum Geologists, resulted from a recommendation by the AAPG Marine Geology Committee in 1986. Most of the papers in the present volume were given at the symposium; however, a few were solicited later to fill in what were believed to be critical gaps in the original program. All of the papers are oriented toward the hydrocarbon potential of Antarctica. Contents include regional seismic surveys involving tectonic and stratigraphic interpretations: comparisons of Mesozoic sedimentary basins and source rock analyses; tectonic synthesis of Antarctica and the surrounding southern seas; hazards to petroleum exploration and production offshore; specific source rock information from a single borehole; and an inventory of relevant offshore seismic surveys for making seismic interpretations.

E-44552

Anderson, J.B., Pope, P.G., Thomas, M.A., **Evolution and hydrocarbon potential of the northern Antarctic Peninsula continental shelf**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.1-12, 39 refs.

DLC TN870.5.A63 1990

The study area consists of a foredeepened shelf, typical of the antarctic continental shelf. The continental margin has evolved from an active margin to a tectonically passive one as the Aluk Ridge was gradually subducted at the Antarctic Plate Boundary. This transition was diachronous, as the timing of ridge subduction proceeded from south to north (oldest to youngest). Thus, the shelf is segmented both tectonically and sedimentologically as the extent of tectonic deformation and post-tectonic sedimentation varies correspondingly. The hydrocarbon potential for that portion of the continental shelf situated north of the Tula Fracture Zone is low, but is slightly higher for that portion of the shelf situated south of the Tula Fracture Zone. This is because the age and thickness of sedimentary deposits increases to the south, and the time window for formation and burial of suitable source and reservoir rocks increases in that direction. The oldest development sequence is believed to include carbonaceous marine shales deposited when the climate was temperate, and is considered to be the most likely hydrocarbon source, at least south of the Anvers Fracture Zone. The siliciclastic deposits of Sequence 3 are the most probable reservoir rocks. (Auth. mod.)

E-44555

Cooper, A.K., Davey, F.J., Hinz, K., **Geology and hydrocarbon potential of the Ross Sea, Antarctica**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.47-67, 86 refs.

DLC TN870.5.A63 1990

The Ross Sea contains three major depocenters, each underlain by a sediment-filled rift graben and an overlying glacial sedimentary sequence. The sedimentary sections are up to 14 km thick with up to 8 km in the rift grabens and up to 6 km in the presumed-glacial sequences. The hydrocarbon potential of the Ross Sea is poorly known because only post-Eocene glacial rocks have been sampled offshore. The age and type of rocks filling the rift grabens, below the glacial sequence, is unknown. Source beds do not occur in the glacial sequence, but may exist in the rift grabens. Structural and stratigraphic traps are likely near basement structures and unconformities, which are common, and near large sedimentary structures found only in the Victoria Land Basin and along margins of the Eastern Basin. Reservoir rocks are unknown but sands could occur throughout the glacial and rift sequences. Lopatin-Waples models indicate that hydrocarbons could be generated presently at depths of 2.5 to 4.0 km, if source beds exist. Migration is likely in dipping strata along rift-

graben flanks and in late-rift fault zones of the Terror Rift. Hydrocarbon seeps and accumulations are unknown in the Ross Sea. The preglacial strata that are deeply buried within the early-rift grabens have the best hydrocarbon potential; however, a definitive assessment awaits sampling of these deep rift deposits. (Auth. mod.)

E-44556

Behrendt, J.C., **Multichannel seismic reflection surveys over the antarctic continental margin relevant to petroleum resource studies**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.69-75, 29 refs.

DLC TN870.5.A63 1990

More than 100,000 km of marine multichannel seismic profiles have been acquired over the continental margin of Antarctica since 1976 by scientific research programs of Australia, Brazil, France, Italy, Japan, Norway, Poland, United Kingdom, United States, U.S.S.R. and West Germany. Although scientific results are reported for most of these data, they also are relevant to petroleum resource assessment. Because of the one or two orders of magnitude greater cost of standard land survey techniques in Antarctica compared with marine techniques in areas of open water, there will likely be no great amount of coverage on the interior of the antarctic ice sheet. Despite this, several countries are experimenting in a research mode using land systems, and deep crustal reflection surveys at carefully selected interior sites will probably be made soon. Regions in which studies have been conducted include the Ross Sea, Antarctic Peninsula, Weddell Sea, and Prydz Bay. (Auth. mod.)

E-44557

Wannesson, J., **Geology and petroleum potential of the Adélie Coast margin, East Antarctica**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.77-87, 53 refs.

DLC TN870.5.A63 1990

On the Adélie Coast continental margin, a multichannel seismic survey has revealed the presence of a thick sedimentary basin, beneath the outer continental shelf and upper slope, that may exceed 6000 m. This basin results from the creation and evolution of a continental margin, initiated about 100 million years ago from the separation of Australia and Antarctica. Beneath the outer shelf, which is 400-500 m deep, the sedimentary series consists of four units separated by three major unconformities: a prerift unit including a Precambrian basement, possible Paleozoic and early Mesozoic sediments and a Mesozoic synrift sequence; an early postrift unit, ranging in age from Cenomanian to Eocene, assumed to consist mainly of fluvial to deltaic clastics; an Upper Eocene to Oligocene unit in a shallow marine environment; and a Neogene glacial prograding unit. The early postrift unit is considered to be a promising petroleum target based on comparison to other passive margins. (Auth.)

E-44558

Royer, J.Y., **Tectonic chart for the southern ocean derived from Geosat altimetry data**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.89-99, 88 refs.

DLC TN870.5.A63 1990

Presented is a new tectonic fabric map of the southern ocean south of 45S, derived from Geosat altimeter profiles and published bathymetric charts and magnetic anomaly picks. The interpretation of the Geosat data is based on an analysis of the first derivative of the

geoid profiles (i.e., vertical deflection profiles). To improve the accuracy and resolution of the vertical deflection profiles, 22 repeat cycles from the first year of the Geosat/Exact Repeat Mission (Geosat/ERM) were averaged. At wavelengths less than about 200 km, the vertical deflection is highly correlated with sea-floor topography and thus reveals major features in areas that were previously unsurveyed. The density of the Geosat data is greatest in the high latitudes where lineated bathymetric features such as fracture zones, spreading ridges, trenches, and rifted margins stand out. To construct the tectonic fabric chart, the Geosat data are analyzed in combination with available shipboard bathymetric data and magnetic anomaly identifications. (Auth.)

E-44559

Macdonald, D.I.M., Butterworth, P.J., **Stratigraphy, setting and hydrocarbon potential of the Mesozoic sedimentary basins of the Antarctic Peninsula**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.101-125, Refs. p.122-125.

DLC TN870.5.A63 1990

The peninsula lies on a medium-sized block of continental crust. It is one of a mosaic of crustal blocks forming West Antarctica which underwent a complex tectonic evolution during Gondwana breakup. It was the site of an active volcanic arc above easterly subducting proto-Pacific ocean floor throughout the Mesozoic and part of the Cenozoic. As a result the exposed Mesozoic basins display a complex stratigraphy, reflecting local tectonic and volcanic events. No units can be correlated between any two basins, but there are a few general trends. Almost all basins are post-Oxfordian; their fill is entirely clastic, and largely derived from the Antarctic Peninsula volcanic arc. Most basins were affected by a period of arc expansion in late Jurassic or Early Cretaceous times, which manifests itself as inputs of lava or coarse volcanoclastic sediment. Berriasian and older mudstones are generally finer-grained and darker than mudstones from post-Berriasian strata. Deformation is variable, but rarely penetrative. This stratigraphic information provides the basis for general constraints on the hydrocarbon potential. Organic geochemistry shows that Berriasian and older mudstones from the backarc region are the best potential oil source rocks; all other mudstones tend to be lean and gas-prone. Reservoir and seal facies tend to be better in deep marine (generally older) strata. Reservoir quality is generally poor due to breakdown of labile volcanic grains, but younger sandstones tend to be more quartz-rich. (Auth. mod.)

E-44561

Collen, J.D., Barrett, P.J., **Petroleum geology from the CIROS-1 drill hole, McMurdo Sound: implications for the potential of the Victoria Land Basin, Antarctica**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.143-151, 57 refs.

DLC TN870.5.A63 1990

The strata cored by CIROS-1 have a uniformly low organic carbon content (average total organic carbon 0.34%), little hydrocarbon generating potential (maximum 0.34 mg hydrocarbons per gram of rock), and a low level of thermal alteration (vitrinite reflectance of 0.36% at 670 m). Kerogen is mainly highly oxidized terrestrial organic matter reworked from older strata. Residual asphaltic oil was found in minute quantities in sandstone at 632 mbsf. Geochemical studies indicate that it formed at greater depth, probably in nearshore clastic sediments with both marine and terrestrially derived organic matter. Similar coarse- to fine-grained feldspathic sandstones are common in the mudstone that forms the lower half of the core, and offer reservoir potential. Calcite and zeolite cements are common

but in-situ porosities range up to 22%, with good dissolution porosity in some intervals. On balance, the possible prospects of Oligocene strata on the margin of the Victoria Land Basin must be considered low. Source characteristics are unfavorable and only minute amounts of hydrocarbons have been encountered. In addition, the up-dip location of CIROS-1 with respect to the basin center suggests that the possible prospects of the western Victoria Land Basin should also be regarded as low. (Auth. mod.)

E-44588

Yanai, K., ed, NIPR Symposium on Antarctic Meteorites, 15th, Tokyo, May 30-June 1, 1990, **Proceedings of the NIPR Symposium on Antarctic Meteorites, No.4**, Tokyo, National Institute of Polar Research, 1991, 446p.

Eighty-seven scientific papers were presented, and 74 of them were read at the symposium, the 15th such conference since the meteorite series began as Memoirs of the NIPR in 1975. Twenty-five scientific papers are gathered in this volume of the proceedings. These papers cover various subjects such as petrology, mineralogy, chemical studies, isotope studies and physical studies on antarctic and non-antarctic meteorites, and related subjects. This volume consists of part A and part B. Part A contains reports of three consortium studies: lunar meteorites, unique meteorites and carbonaceous chondrites. The papers of part B present general topics of antarctic meteorites and related subjects.

E-44589

Takeda, H., Saito, J., Yanai, K., Kojima, H., **Consortium reports of lunar meteorite Yamato-793274**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.3-11, 26 refs.

Yamato (Y)-793274 is a fragmental breccia with some regolith components and is rich in pyroxene fragments. Chemical variation of pyroxenes in Y-793274 can be interpreted in terms of chemical zoning similar to those found in a rare basaltic clast in Apollo 16 breccia, 60019. Some pyroxene fragments show thin exsolution lamellae. The most magnesian gabbroic clast found consists of nearly homogeneous olivine, plagioclase, and pigeonite with fine exsolution. Plagioclase fragments show much wider variation in An contents than other lunar meteorites. All these data indicate that Y-793274 is a regolith breccia with components suggestive of mare origin (or non-highland). The mare components are not always surficial basalts, and may be a coarse-grained rock similar to the basaltic clast with chemically zoned pyroxenes in 60019, which is different from the mare basalt samples collected by the Apollo missions. (Auth.)

E-44590

Lindstrom, M.M., Mittlefehldt, D.W., Martinez, R.R., Lipschutz, M.E., Wang, M.S., **Geochemistry of Yamato-82192, 86032, and -793274 lunar meteorites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.12-32, 48 refs.

The major and trace element compositions of lunar meteorites Yamato (Y)-82192, Y-86032 and Y-793274 were determined by neutron activation analysis. Y-82192 and Y-86032 are anorthositic lunar meteorites rich in Al₂O₃ and CaO and poor in FeO, MgO and incompatible elements. Although these meteorites are similar in composition to each other and other anorthositic lunar meteorites, they are distinct in several key compositional characteristics. Y-793274 is a basaltic lunar meteorite rich in FeO, MgO, Sc, Cr, Co, and incompatible elements, and poor in Al₂O₃ and CaO compared to anorthositic lunar meteorites. It is similar in many ways to lunar meteorite EET87521 which is also a basaltic breccia. It is distinct from EET87521 in its higher proportion of highland material, its

meteoritic contamination and regolith glass, and in the composition of its dominant basalt component. Y-793274 contains 65-75% magnesian VLT basalt, while EET87521 consists of ferroan VLT basalt. The eleven lunar meteorites probably represent eight distinct falls. Four are anorthositic and four are basaltic. This 50-50 proportion of highlands-mare material contrasts strongly with the 83-17 proportion derived from photogeologic mapping. The dominance of VLT basalt among lunar meteorites contrasts with its scarcity among Apollo samples. (Auth.)

E-44591

Koeberl, C., Kurat, G., Brandstätter, F., **Lunar meteorite Yamato-793274: mixture of mare and highland components, and barringerite from the moon**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.33-55, 54 refs.

Two small samples of the new lunar meteorite Yamato-793274 have been studied for mineralogical, petrological, and geochemical composition. The meteorite has a coarse grained texture and consists of a dense breccia that contains relatively large and abundant mineral fragments, rare fine-grained granulitic breccias, and some mostly brownish devitrified glass. The matrix is abundant, dense, and consists of mineral fragments and interstitial mostly recrystallized glass. All plagioclase fragments are highly anorthitic, and olivine compositions range from Fo₄₆₋₇₂. The occurrence of these breccias and plagioclases, as well as the chemistry of some matrix glass, is consistent with an origin from the lunar highlands. However, some glasses have a considerably more mafic composition and show admixture of a low *mg*-component. Pyroxenes are unusually abundant when compared with other lunar meteorites. Among opaque phases, kamacite, and a Co-rich taenite were found, and, for the first time in lunar rocks, the rare higher phosphide barringerite, (Fe, Ni)₂P. The bulk major and trace element composition is unlike the anorthositic lunar highland meteorites (e.g., ALHA81005, Y-791197, Y-86032, MAC88104/5), but somewhat similar to the newly identified mare meteorite EET87521. (Auth. mod.)

E-44592

Tatsumoto, M., Premo, W.R., **U-Pb isotopic characteristics of lunar meteorites Yamato-793274 and Yamato-86032**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.56-69, 23 refs.

U-Pb data from lunar meteorites Y-86032 and Y-793274 confirm that they are of lunar origin, but also indicate that they are not from the same source region on the Moon and experienced different events while residing as lunar regolith. The Pb of both clast and matrix from Y-86032 is the least radiogenic among lunar meteorites thus far analyzed, similar to that of lunar anorthosite 60025, and indicates derivation from a low U-235/Pb-204(*mu*) source, assuming initial lunar Pb compositions were essentially primitive in nature. Whereas the data from Y-86032 plot slightly above the geochron on a Pb-206/Pb-204 vs. Pb-207/Pb-204 diagram, data from 60025 and Y-82192 plot precisely on the geochron. Very small amounts of U, Th, and Pb were leached from Y-86032 using 0.1N HBr; the Pb isotopic compositions of the leaches are essentially modern terrestrial values, indicating that this rock probably did not reside long at the lunar surface and was not exposed to volatile-rich gases expelled during impact event(s). In contrast, large amounts of the three elements (up to five times those of Y-86032) were removed from Y-793274 during leaching, and the Pb isotopic compositions of these leaches are very radiogenic and similar to those of mare basalt and some lunar soils, indicating that this rock was subjected to lunar impact-related, volatile-rich gases containing radiogenic Pb-206-rich Pb, very similar to typical lunar soils and some breccias containing significant amounts of mare-derived material. (Auth. mod.)

E-44593

Yanai, K., Kojima, H., **Varieties of lunar meteorites recovered from Antarctica**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.70-90, 33 refs.

By the 1988-1989 field season, more than 10 specimens of lunar meteorites had been recovered in Antarctica by the U.S. and Japanese expeditions. The specimens from the Yamato Mountains, Allan Hills and MacAlpine Hills (Y-791197, Y-82192/193, Y-86032, AL-HA81005, MAC88104/105) are all plagioclase (anorthite)-rich breccias from the lunar highlands. Y-973274 is a pyroxene- and plagioclase-rich breccia, and EET87521 [5] is basaltic clast-rich breccia: both contain abundant components from the basaltic provinces (the maria) of the lunar crust. Asuka-31 and Y-793169 are unbrecciated, coarse-grained rocks consisting mainly of pyroxene and plagioclase (maskelynitized), together with ilmenite and troilite. The bulk compositions of Asuka-31 and Y-793169 are very similar to low-titanium and very low-titanium (VLT) lunar mare basalts. On the basis of lithology, texture, petrography, chemistry and mineral compositions, the lunar meteorites can be divided into 4 or more different types, namely anorthositic breccias (including 3-4 different facies), basaltic-anorthositic breccias, basaltic breccias, and unbrecciated diabase and gabbro. These types indicate that the samples might have originated from at least 7 different sites on near- and far-side sites of the Moon. The different types of lunar meteorites strongly suggest that there are other unknown rock type(s) on the Moon, and that new meteorite types are to be expected in Antarctica. (Auth.)

E-44594

Warren, P.H., Kallemeyn, G.W., **Geochemical investigation of five lunar meteorites: implications for the composition, origin and evolution of the lunar crust**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.91-117, 91 refs.

The total number of lunar meteorites found is now eleven, and the number of distinct finds now stands at eight. New data are reported for the bulk compositions of five lunar meteorites, including Y-793274, a unique regolith breccia composed of 2/3 mare material of VLT (very-low-Ti) affinity and 1/3 highlands material compositionally similar to Apollo 16 regolith. Mixing-deconvolution of the bulk-rock composition shows that for any reasonable assumed highlands-component composition, the TiO₂ content of the mare component must be <1.2 wt%. A unique clast from the Y-791197 highlands regolith breccia is also probably of VLT-mare affinity, based on its REE pattern, Sc/Sm, Mn/Sm, and Eu/Al ratios, and the low Ti/(Ti+Cr) ratio of its pyroxene. VLT affinities have previously been inferred for numerous mare clasts observed in thin section studies of highlands meteorites, and three other recently-discovered lunar meteorites have either VLT or borderline VLT/"normal" mare compositions. Apparently, the abundance of VLT-basaltic matter in the lunar crust is greater than previously supposed; and the fundamental dichotomy of lunar magmatism into distinct nonmare and mare styles may have been less abrupt than commonly envisaged. Alternatively, the prevalence of VLT varieties of mare basalt among the lunar meteorites might be a sign of source-crater pairing. However, it seems probable that at least three, and more likely five or more, separate craters are represented; and at least one of the sources is probably on the far side. (Auth. mod.)

E-44595

Yanai, K., Kojima, H., **Yamato-74063: chondritic meteorite classified between E and H chondrite groups**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.118-130, 20 refs.

Y-74063 is an almost complete, smoothly rounded stone weighing 35.4 g and covered with brownish-black fusion crust. The thin section shows that this meteorite has generally poorly traced chondritic texture and "chondrules" merge into the recrystallized matrix. Compositions of olivine and low-Ca pyroxene are homogeneous, and strongly suggest that Y-74063 is not similar to all the previously known chondrites. Bulk analysis shows that the total iron content of Y-74063 is the lowest of the ordinary chondrite groups, and the abundance of troilite is much higher than that in all ordinary chondrites. Texture, bulk and mineral compositions of Y-74063 indicate that this meteorite is identified as chondrite and classified into a new type of chondrite group between E and H chondrite groups. Y-74063 is similar to Acapulco ALH-77081 and ALH-78230 in mineral composition which occupies the intermediate site between the E and H chondrites. But bulk composition indicates that Y-74063 differs from Acapulco-type meteorites and all previously known chondrite groups. The presence of Y-74063 suggests that there is a great possibility of the existence of more unknown meteorite types in Antarctica and non-antarctic regions. (Auth. mod.)

E-44596

Ikeda, Y., Tsuchiyama, A., Ebihara, M., **Petrological and geochemical study of the Yamato-74359 and Yamato-74360 achondrites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.131-143, 9 refs.

Two antarctic achondrites, Y-74359 and Y-74360, are very similar in bulk chemical compositions to the silicate portions of H chondrites, but the siderophile elements are extremely depleted in comparison to those of H chondrites. They consist of olivine, pyroxene and cryptocrystalline feldspar with minor amounts of chromite, kamacite, and troilite, and the chemical compositions of the constituent minerals are similar to those in H chondrites. Considering that the two achondrites have oxygen isotopic compositions typical of H chondrites, they seem to have been produced from H chondrites or the precursors of H chondrites. Chondrules are not observed, and the textures of the two achondrites are similar, although Y-74360 is coarser-grained than Y-74359. Olivine occurs as euhedral or subhedral grains, mostly smaller than 100 microns in diameter, and they show slight chemical zoning. Orthopyroxene occurs as euhedral grains, larger than olivine grains, and also shows slight chemical zoning. Clinopyroxene occurs as rims of orthopyroxenes and shows remarkably continuous chemical zoning. Cryptocrystalline feldspar occurs in interstitial spaces between olivine and/or pyroxene, and seems to have crystallized in interstitial liquids in a rapid cooling condition. The cryptocrystalline feldspars in Y-74359 are chemically heterogeneous and classified into three groups. (Auth. mod.)

E-44597

Nagahara, H., **Petrology of Yamato-75261 meteorite: an enstatite (EH) chondrite breccia**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.144-162, 17 refs.

Y-75261 is a breccia with a non-porphyrific clast embedded in the partly porphyritic matrix. The clast consists mainly of closely packed fine-grained enstatite with interstitial material rich in Al. Metallic iron and troilite are rare. An anomalous Fe-Mn-Mg-Ca-Cr monosulfide which lies between alabandite in EL chondrites and niningerite in EH chondrites occurs in the interstices of the clast. The heterogeneous matrix consists of enstatite, forsterite, glass, fine-grained materials, and rare troilite. Chemical compositions obtained by the broad beam analysis of a microprobe are highly fractionated. Both the clast and matrix are especially depleted in siderophile elements, which is in accordance with apparent depletion of metallic iron over the thin section. Al, Fe, Na, Si, Ca, and S are enriched in the matrix portion; Mg is enriched in the clast. Texture, mineral assemblage, and mineral compositions along with oxygen isotopic composi-

tions suggest that Y-75261 is a breccia related to enstatite chondrites. The CaO content of enstatite, Ni, and Si, P contents of kamacite, and Ti and Cr contents of troilite indicate a closer affinity to EH chondrites than to EL's in spite of the intermediate composition of the sulfide. (Auth. mod.)

E-44598

Hiroi, T., Takeda, H., **Reflectance spectroscopy and mineralogy of primitive achondrites-lodranites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.163-177, 25 refs.

Reflectance spectra of three mineralogically characterized primitive achondrites have been measured for the first time and are compared with that of 29 Amphitrite to gain better understanding of the origin of the S-type asteroids. These achondrites can be arranged in order of increasing degree of reduction from chondrites as follows: Acapulco-type winonaite Allan Hills (ALH)-78230 and ALH-77081, lodranite Yamato (Y)-791491, and a partly reduced lodranite Y-74357. A proposed pairing of Y-791491 with Y-791493 has been supported by the authors' mineralogical characterization. Olivine crystals in Y-74357, which is similar to carbon-free ureilite, have many fractures decorated by troilite, and Mg/(Fe+Mg) ratio more reduced than that of the coexisting pyroxene. As a result of simulations of the reflectance spectrum of Amphitrite by those of the primitive achondrites and an iron meteorite, it is suggested that a primitive achondrite more reduced than Y-74357 can reproduce the S-type spectrum. (Auth.)

E-44599

Takaoka, N., Yoshida, Y., **Noble gas composition in unique meteorite Yamato-74063**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.178-186, 29 refs.

Unique meteorite Yamato-74063 contains large amounts of trapped heavy noble gases whereas it is depleted in trapped He and Ne. The concentration of trapped Ar-36 is comparable with that of E- and C-chondrites and ureilites. Trapped Xe-132 is unusually abundant. Y-74063 contains a very high concentration of radiogenic Xe-129. Trapped Ne-20/Ar-36 is low and similar to that of ureilites. Trapped Ar-36/Xe-132 of 32 is lower than that of any meteorites yet reported. The trapped gases in Y-74063 are depleted in Ar relative to Xe. Planetary-type noble gases may be mixtures of an Ar-depleted component and the "sub-solar" or "Ar-rich" component isolated in E-chondrites. The cosmic-ray exposure age is 6.2 Ma. Gas-retention ages are calculated to be less than 3.7 and 4.8 Ga from radiogenic He-4 and Ar-40, respectively. The K-Ar age older than the age of the solar system is attributed to chemical inhomogeneities resulting in an exceptionally high K concentration of the investigated sample. The gas-retention ages, the large amounts of radiogenic Xe-129 and the trapped noble gases indicate that the meteorite was a closed system for the noble gases since crystallization. (Auth.)

E-44600

Ikeda, Y., **Petrology and mineralogy of the Yamato-82162 chondrite (CI)**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.187-225, 29 refs.

Yamato-82162 (Y-82162) is a regolith breccia including many kinds of clasts. The clasts are organized into 6 groups on the basis of the predominant phase and the textures. They are phyllosilicate, carbonate, unusual, magnetite, composite, and matrix-like clast-types. The phyllosilicate clasts are subdivided into two subtypes, sodian talc-rich and chlorite-rich. The sodian talc-rich clasts consist mainly of sodian talc and minor chlorite (or serpentine), and they are coarse-grained and homogeneous in chemical composition. They seem to

have formed in the hot and deep interior of the parent body. Chlorite-rich clasts, magnetite clasts, and matrix-like clasts consist mainly of chlorite and minor sodian talc, and they show unique microtextures; amygdale, network-like, and microspherulitic. The three clast-types seem to have formed near the surface of the parent body. Matrix-like and composite clasts are sometimes cut across by phyllosilicate veins, which may have been formed by a fluid coming from the interior of the parent body where sodian talc c-rich clasts were produced. (Auth. mod.)

E-44601

Bischoff, A., Metzler, K., **Mineralogy and petrography of the anomalous carbonaceous chondrites Yamato-86720, Yamato-82162, and Belgica-7904**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.226-246, 40 refs.

These carbonaceous chondrites are unique samples and do not perfectly fit in the traditional classification schemes. Therefore, they have to be considered as very important samples to carry distinct information about processes in the early solar system. Y-82162 is a very fine-grained carbonaceous chondrite. Based on the occurrence of abundant clasts (up to several mm in size) this sample appears to be a chondritic breccia. The dominating phases are phyllosilicates; abundant sulfide grains are scattered throughout the entire sample. However, the abundances of sulfides vary from clast to clast. Y-86720 contains about 13 vol% of light objects embedded in a fine-grained, phyllosilicate-rich groundmass. Some of these objects appear to be relict chondrules; however, they essentially consist of phyllosilicates. Most light, round to irregularly-shaped components exhibit well-preserved accretionary dust mantles ("dark rims") similar to those found in CM-chondrites. Y-86720 is mineralogically more closely related to the CI-chondrites than to any other chondrite group; texturally, however, it appears to be an intermediate chondrite between CI and CM as also suggested by bulk chemical criteria. B-7904 contains 18 vol% of objects larger than about 70 microns in size. 42 vol% of these components are chondrules or chondrule fragments. The most abundant constituents are, however, olivine-bearing, fragment-like objects (45.9 vol%) unknown from other chondrites. The olivines within these components are embedded in a fine-grained brownish-grey matrix. Other constituents include fine-grained CAIs, olivine aggregates, and mineral fragments. (Auth. mod.)

E-44602

Shimoyama, A., Komiya, M., Harada, K., **Release of organic compounds from some antarctic CI and CM chondrites by laboratory heating**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.247-260, 24 refs.

Thermal release of organic compounds from three CI chondrites and from three CM chondrites was examined by DTA/TG-MS analysis. For identification of the compounds released, Y-791198 was also examined by DTA/TG-GC/MS analysis. The relative amounts of organic compounds released from these chondrites are, Y-74662 as Y-791198 > Y-82162 > Y-793321 as B-7094 > Y-86720, where as means about the same as. The compounds released are aliphatic and aromatic hydrocarbons and N-, S-, and O-containing compounds. Of these, benzene and thiophene are the most abundant. Release patterns of some representative compounds were obtained along a programmed temperature profile from room temperature to 800 C. These patterns fall under one of two kinds; in one the release starts around 250 C and continues to 700 C, and in the other release starts at 100 C-150 C and ends at 300 C. The kinds and amounts of the organic compounds released are roughly related to the extent of the alteration and/or metamorphism of the chondrites as determined by mineralogical and petrographic studies. (Auth.)

E-44603

Ikeda, Y., Kojima, H., **Terrestrial alteration of Fe-Ni metals in antarctic ordinary chondrites and the relationship to their terrestrial ages**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.307-318, 7 refs.

Terrestrial alteration of Fe-Ni metals to limonites in ordinary chondrites is faster for kamacite than for taenite. H chondrites which have high ratios of kamacite/taenite alter more easily than LL chondrites which have low ratios, L chondrites being intermediate. Qualitative weathering indices, A, B, and C correspond to measured average alteration degrees (proportion of metal converted to limonite) of <5%, 10-20%, and >50%, respectively. The surfaces of chondritic meteorites show higher degrees in alteration of Fe-Ni metals than the interiors, although the difference in the degree is merely a factor of two. There is no correlation between the average alteration degrees and the terrestrial ages for H and L chondrites, but the average alteration degree seems to depend upon the degrees of impact shocks which the chondrites had suffered in or on the parent body. (Auth.)

E-44604

Sears, D.W.G., Batchelor, J.D., Lu, J., Keck, B.D., **Metamorphism of CO and CO-like chondrites and comparisons with type 3 ordinary chondrites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.319-343, 81 refs.

In order to explore their metamorphic history, thermoluminescence data have been obtained for 10 CO or CO-related chondrites from the Antarctic. Six have TL properties indicating low to intermediate levels of metamorphism, while Lewis Cliff 85332 and three paired meteorites from MacAlpine Hills (87300, 87301 and 88107) have unusual TL properties similar to those of the very primitive Colony and Allan Hills A77307 CO-related chondrites. Cathodoluminescence photomosaics of nine well-studied CO chondrites are also presented and compared with similar data for the type 3 ordinary chondrites in which CL properties vary systematically with metamorphism. It is concluded that the CO chondrites, like the ordinary chondrites, form a metamorphic sequence and may be subdivided in an analogous manner using TL, CL and other petrographic and compositional data. Definitions for CO chondrites of the petrologic types 3.0-3.9 are proposed. However, it is stressed that the thermal history of the CO and ordinary chondrites is quite different; the range of equilibration for the CO chondrites is similar to the ordinary chondrites, but the former have not experienced temperatures above those experienced by type 3.5 ordinary chondrites. (Auth.mod.)

E-44605

Ninagawa, K., **Thermoluminescence characteristics and chemical compositions of mesostases in ordinary chondrites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.344-351, 18 refs.

TL images of the ordinary chondrites ALH-77214(L3.4-3.5), Y-74191(L3.6), ALH-77216(L3.8) and ALH-78043(L6) were measured and their chemical compositions were analyzed. The mesostasis was responsible for much of the TL in the ordinary chondrites. A mesostasis of normative anorthite compositions showed low peak temperature (about 90 C) and narrow width (about 65 C), while a mesostasis of normative albite compositions showed high peak temperature (about 125 C) and wide width (about 100 C). A main phosphor in a low petrologic grade chondrite <3.5 was a high anorthite mesostasis and that in high grade chondrites >3.5 was a high albite mesostasis. Some chondrules in the same fragments of the type 3 chondrites showed little or no emission and these mesostases had high normative albite. These facts suggest that in type 3 ordinary chondrites the post-accretional metamorphism cannot account for the coexistence of

high albite mesostases with TL emission and no emission and a high anorthite mesostasis with TL emission; and low petrologic grade chondrites >3.5 have a large population of slowly cooled chondrules. (Auth. mod.)

E-44606

Sugiura, N., Hashizume, K., **Heavy nitrogen in the Yamato-74191 and the heterogeneity of the primitive solar nebula**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.352-370, 32 refs.

A systematic search for presolar grains in ordinary chondrites was made by measuring isotopes of nitrogen. Only one chondrite (Yamato-74191) out of 20 ordinary chondrites showed the presence of very heavy nitrogen of probably presolar origin. The heavy nitrogen is not particularly concentrated in either magnetic nor non-magnetic fractions. The HF/HCl residue is enriched in nitrogen but the heavy nitrogen has not been identified. The release patterns of excess N-15 are similar to those of primordial Ar. Chondrites more primitive than the Y-74191 do not contain the heavy nitrogen, suggesting heterogeneous distribution of the carrier of the heavy nitrogen. Together with evidence for the heterogeneous distribution of presolar SiC in meteorites, it is concluded that exotic materials were not well mixed in the primitive solar nebula. (Auth.)

E-44607

Kagi, H., Takahashi, K., Shimizu, H., Kitajima, F., Masuda, A., **In-situ micro Raman studies on graphitic carbon in some antarctic ureilites**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.371-383, 22 refs.

The fine structures of graphitic materials contained in four antarctic ureilites (ALH-77257, ALH-78019, MET-78008 and Y-791538) were investigated using a laser light, which could be focused onto a spot of 1 micron in diameter. Raman spectra obtained differ not only among individual ureilite samples, but also among positions within a single carbonaceous vein of the same specimen. Moreover, the carbon can be classified into several groups on the basis of the spectra concerned. For all samples, both well-ordered graphitic carbon and semi-ordered graphitic carbon were observed. Amorphous carbon was detected in ALH-77257 and MET-78008. The difference in structural ordering among the samples is attributed to the difference in distribution of the components of carbonaceous material, indicating minor difference in genetic conditions or in locality within the parent body. Structural heterogeneity of carbon within a single carbonaceous vein implies the occurrence of two or three types of carbonaceous matter which have fairly different physicochemical properties and distinct histories. For the genesis of the carbonaceous matter in ureilites, a two-stage model is proposed assuming the graphite crystallization from metallic phase followed by the inflow of semi-ordered graphitic carbon or amorphous carbon into the well-ordered graphitic carbon produced from the metal. (Auth.)

E-44608

Murae, T., Kitajima, F., Masuda, A., **Pyrolytic nature of carbonaceous matter in carbonaceous chondrites and secondary metamorphism**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.384-389, 16 refs.

Major carbonaceous matter in five C2 carbonaceous chondrites and six C3 carbonaceous chondrites was investigated by pyrolysis-gas chromatography. The amount of naphthalene produced in the pyrolysis varied largely from chondrite to chondrite, and the carbonaceous matter in these chondrites could be divided into five groups by the efficiency of formation of pyrolysis products. The groups did not accord with any conventional subdivisions of carbonaceous chondrites. The grouping based on the pyrolytic nature of the major carbonaceous

matter may give additional information about secondary metamorphism in carbonaceous chondrites. (Auth.)

E-44609

Nagata, T., Funaki, M., Kojima, H., **Magnetic properties and natural remanent magnetization of carbonaceous chondrites containing pyrrhotite**, NIPR Symposium on Antarctic Meteorites, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.390-403, 15 refs.

Magnetic properties, NRM characteristics and magnetic minerals of four carbonaceous chondrites, the Allende, the Leoyille, Y-74662 and Y-81020, are examined. These C-chondrites contain ferrimagnetic pyrrhotite grains in addition to magnetite, kamacite and/or taenite as magnetic minerals possessing NRM. The low temperature NRM component which is possessed by ferrimagnetic pyrrhotite at temperatures below 300 C indicates that the corresponding paleointensity is around 1 Oe in order of magnitude. The high temperature NRM component possessed by magnetite and/or taenite is magnetic at temperatures below about 600 C. The kamacite magnetization contributes very little at temperatures below 770 C. (Auth.)

E-44614

Paech, H.J., Laiba, A.A., Shuliatin, O.G., Aleksashin, N.D., Traube, V.V., **Contribution to the geology of western Dronning Maud Land: present knowledge, latest results and unsolved problems**, *Zeitschrift für geologische Wissenschaften*, 1991 19(2), p.127-143, With German summary. 54 refs.

Based on published data and observations made during the 33rd SAE, geology of western Dronning Maud Land is summarized. New results concern the general lithostratigraphic subdivision, and the tectonic pattern of the Ahlmannryggen Group, particularly in the region with cleavage adjacent to the Jutul-Penck rift zone. The tectonic structure of the Urfjell Group is characterized by fault-controlled cleavage, widespread cataclasis and low-grade metamorphism. The Sverdrupfjella Metamorphic Complex shows b-lineations of ESE trend. The geologic history of the region of the Jutul-Penck rift zone is dominated by compressional tectonics including upthrusting and cleavage formation in Rhiphaean times. Typical rift tectonics is restricted to the Phanerozoic period. The problems of the age of the Urfjell Group, of the tectonics within the Ritscherflya Supergroup and the Precambrian history of magmatism remain unsolved. (Auth.)

E-44615

Wetzel, H.U., Stackebrandt, W., Hahne, K., **Results on geological mapping in the nunataks area south of the Schirmacher Oasis, East Antarctica**, *Zeitschrift für geologische Wissenschaften*, 1991 19(2), p.145-152, With German summary. 9 refs.

This investigation is mainly based on field work by GDR geologists during two field seasons in the years 1985/86, 1986/87 and on that of former Soviet expeditions. The rock unit of the nunataks region subdivided into 2 Proterozoic metamorphic complexes of polymetamorphic granulite and amphibolite facies rocks. The nunataks form the southern continuation of sequence A-G of the Schirmacher Oasis Metamorphic Complex (SOMC). The southwestern nunataks represent the Nunataks Metamorphic Complex (NMC). This complex was overthrust over the SOMC in the north. The NMC includes exposures of about 2,200 m metamorphic rocks which differ from those of SOMC by a slightly higher content of carbonates, stronger metamorphism, wide-spread occurrence of sillimanite-bearing metamorphics and reduced influence of migmatization processes. Like the succession of sequences of the SOMC, the succession of NMC sequences 1-7 does not represent the primary arrangement because of the various stages of tectonic stacking which can be deduced from the tectonic fault pattern. Further investigation of the metamorphic and tectonic development of the nunataks region will

provide regional comparison with the Schirmacher area and Queen Maud Land within the framework of the planned GEOMAUD project. (Auth. mod.)

E-44616

Balke, J., Haendel, D., Krüger, W., **Contribution to the weathering-controlled removal of chemical elements from the active debris layer of the Schirmacher Oasis, East Antarctica**, *Zeitschrift für geologische Wissenschaften*, 1991 19(2), p.153-158, With German summary. 8 refs.

Temperature measurements of solid bedrock and loose material, measurements of soil humidity and chemical analyses of soil waters and standing waters show that a release and migration of material take place in the periglacial thawing layer during the south polar summer. A precondition of such a transport process is chemical weathering. Up to now the opinion has still predominated that there is no chemical weathering in the Antarctic. The authors' investigations elucidate definite conditions for chemical weathering. It takes place only in the polar summer and its rate is essentially lower in polar regions than in temperate latitudes. The investigations enlarge the knowledge of physical and chemical weathering in the Antarctic and give some indication of the initial processes of pedogenesis (soil formation). (Auth.)

E-44617

Paech, H.J., Hahne, K., Maass, I., **Sedimentological tectonical results on sedimentary rocks outcropping at the southern flank of the Shackleton Range, Antarctica**, *Zeitschrift für geologische Wissenschaften*, 1991 19(2), p.159-167, With German summary. 20 refs.

Sediments outcropping in the southern Shackleton Range are characterized. Its lowermost member is built up of debris rich in weathering material which is depleted in Zn, Co, Mn, Cu, Ba and enriched in Al₂O₃ and oxidized ferrous compounds. The basal quartzite is assumed to be an aeolianite transported from a southern direction. The overlying carbonate-bearing clastics and the arenite-pelite alternation arising from them reflect a shallow marine environment deepening during the accumulation, but not attaining deep water conditions because features indicating turbidites are missing. In palaeogeographic respect the sources area of the sediments is assumed to be located in the east or northeast. Concerning the tectonic structure of the sediments a slightly modified interpretation of the present authors is outlined. In accepting a more intense thrust tectonism caused by rigid scales of the Shackleton Range Crystalline Complex, the long-distance tectonic transport is denied. Recently obtained carbon isotope data ranging from $\delta^{13}C$ -13-20 to -27.3 per mill are explained by tectonically controlled maturation. (Auth.)

E-44618

Wand, U., Mühle, K., **Carbon isotope geothermometry of graphite-bearing marbles from central Dronning Maud Land, East Antarctica**, *Zeitschrift für geologische Wissenschaften*, 1991 19(2), p.169-175, With German summary. 25 refs.

In order to estimate the peak metamorphic temperatures in high-grade regional metamorphic marbles from central Queen Maud Land, C-13/C-12 isotope ratios have been measured for coexisting carbonate-graphite pairs. The $\delta^{13}C$ values of carbonates and graphite vary from -0.1 to +4.6 per mill (PDB) and from -3.3 to +1.7 per mill, respectively. The isotopic fractionation between carbonate and graphite ranges from 2.9 to 4.0 per mill and is similar to the $\delta^{13}C$ values observed in other east antarctic and non-antarctic granulite-facies marbles. The metamorphic temperatures calculated are predominantly in the range of 700-800 C. They agree well with metamorphic temperatures derived from mineral chemical studies of metamorphic rocks from this east antarctic region. (Auth. mod.)

E-44619

Blankenburg, H.J., Wand, U., **Preliminary geochemical study of microcrystalline quartz varieties occurring in volcanic rocks from King George Island, South Shetland Islands, West Antarctica**, *Zeitschrift für geologische Wissenschaften*, 1991 19(2), p.177-184, With German summary. 36 refs.

Microcrystalline SiO₂ varieties (agate, chalcedony, jasper) occurring in basic to intermediate, subduction-related volcanic rocks from King George I. have been analyzed for their trace element contents to test a model for agates as "refused" chert xenoliths. In principle, the geochemical features of the samples studied do not contradict such a hypothesis. However, the geochemical data are also consistent with a metasomatic-hydrothermal process. (Auth.)

E-44620

Weber, B., **Microfossils in Proterozoic sediments from the southern Shackleton Range, Antarctica: a preliminary report**, *Zeitschrift für geologische Wissenschaften*, 1991 19(2), p.185-197, With German summary. 33 refs.

A moderately preserved microfossil assemblage occurs in the lower Turnpike Bluff Group (TBG) of the southern Shackleton Range (Read Mountains, Antarctica). Altogether eight taxa (and three further microstructures of uncertain taxonomic position) belonging to five morphological groups (morphotypes) are described. The assemblage contains predominantly simple spherical to ellipsoid, cell-like microstructures. Cell colonies or complex spherical objects are relatively rare. Furthermore, triangular as well as smooth and spiny vesicles occur only sporadically in the lower TBG. On the basis of the hitherto ascertained specimens the taxonomic position of these microstructures remains uncertain. No filamentous microfossils were found. The fossil assemblage is predominantly characterized by the occurrence of *Stictosphaeridium*-like, *Nucellosphaeridium*-like, and *Trachysphaeridium*-like acritarchs. The taxa *Trachysphaeridium* and *Satka* are the first to be reported from an antarctic deposit. The preliminary micropaleontological results, particularly the occurrence of the genus *Satka* Jankauskas 1979 suggest a late Proterozoic age of the fossiliferous sediments. This result is consistent with biostratigraphic data derived from the occurrence of stromatolite bioherms in the carbonate-bearing clastics from Mount Wegener. (Auth. mod.)

E-44623

Keller, M.A., Díaz, M.T., **Geophysical study in the Larsen Inlet, Antarctica** [Estudio geofísico en la Cuenca de Larsen, Antártida], *Revista brasileira de geofísica*, June-Dec. 1990 8(1-2), p.1-6, In Spanish with English and Portuguese summaries. 26 refs.

During the 1987/1988 antarctic field season a seismic survey was carried out in the NW of James Ross I. A tectonic evolution scheme based on the seismic section analysis and the available geological information is proposed. This scheme is related to a magmatic arc's compressional and tensional strains. Information from the seismic section analysis is correlated with the geological formations described in this zone, and thicknesses are determined. (Auth.)

E-44629

Hill, D.H., Boynton, W.V., Haag, R.A., **Lunar meteorite found outside the Antarctic**, *Nature*, Aug. 15, 1991 352(6336), p.614-617, 19 refs.

Knowledge of the Moon's surface composition has come from samples returned by the Apollo and Luna missions, and from eleven lunar meteorites, all of which were discovered in Antarctica. Reported here is the discovery of a new lunar meteorite, Calalong Creek, in a desert region of Australia which is analogous to Antarctica in its ability to preserve meteorites of different types. On the basis of a

diagnostic Fe/Ma ratio of 73-78, and other element abundances, it is concluded that Calalong Creek is a lunar breccia, containing both highland and mare materials. Whereas the Apollo and Luna missions selectively sampled only 5% of the lunar crust, lunar meteorites should provide a random sample; nevertheless there has been some concern that the antarctic meteorite population may be biased in some way. Calalong Creek will add to the understanding of lunar petrology, and as the first non-antarctic lunar meteorite, may also shed new light on the transfer of impact ejecta from the Moon to the Earth. (Auth.)

E-44633

Doyle, P., **Teuthid cephalopods from the Upper Jurassic of Antarctica**, *Palaeontology*, Feb. 1991 34(1), p.169-178, 45 refs.

Two teuthid cephalopods, *Trachyteuthis* cf. *hastiformis* (Rüppell) and muensterellid gen. et sp. nov., are described from the Nordenskjöld Formation (Upper Jurassic) of the northeastern Antarctic Peninsula. These specimens, the only recorded teuthids from Gondwana, are closely related to European species and suggest a more widespread distribution in the Late Jurassic than was previously known. (Auth.)

E-44635

Birnie, J., **Holocene environmental change in South Georgia: evidence from lake sediments**, *Journal of Quaternary science*, 1990 5(3), p.171-187, 21 refs.

This attempt to interpret a palaeoenvironmental record from lake sediments on South Georgia is based on a wide variety of analyses undertaken on cores from two lakes. Both are in the same unglaciated drainage basin, but one is at 80 m above sea-level and near the altitudinal limit for vegetation growth, whereas the other is at 25 m and within the zone of continuous vegetation cover. Results from both lakes indicate shifts of vegetation boundaries, which, together with evidence for changing biotic productivity within the lakes themselves, are interpreted as indicating climatic changes. The record obtained from the lower lake was shorter, but indicates two periods of harsher climate relative to the present since 4000 yr BP. (Auth. mod.)

E-44641

Dearman, W.R., ed, Sergeev, E.M., ed, Shibakova, V.S., ed, **Engineering geology of the Earth**, Moscow, Nauka, 1989, 246p. (Pertinent p.40-76), Refs. passim.

Two chapters are devoted to engineering geology of permafrost regions. The 1st defines the permafrost zone and presents its types, global distribution, and engineering geological conditions. The 2nd chapter discusses selected permafrost regions, including an overview of Antarctica: the source of ice supply, duration of the glaciation, temperatures, and the stationary equilibrium of the ice dome.

E-44662

Birkenmajer, K., Francalanci, L., Peccerillo, A., **Petrological and geochemical constraints on the genesis of Mesozoic-Cenozoic magmatism of King George Island, South Shetland Islands, Antarctica**, *Antarctic science*, Sep. 1991 3(3), p.293-308, Refs. p.307-308.

Petrological and geochemical data are reported for a series of Late Cretaceous-Middle Miocene volcanic, hypabyssal and intrusive rocks from King George I. (KGI) and from nearby Ridley I. Major element data indicate a calc-alkaline, basic to intermediate composition for the analyzed samples. Although emplaced on a continental margin, the KGI rocks generally display low abundances of incompatible trace elements, close to those typically observed in calc-alkaline suites erupted in intraoceanic island arcs. A few samples have a significant negative Ce anomaly. Many incompatible elements define smooth positive trends on interelemental variation diagrams, which suggests that magmas erupted at different times on KGI maintained a rather constant composition in terms of incompatible element ratios. Geo-

chemical modelling, based on Sr isotope ratios and incompatible element ratios, suggests that the primary calc-alkaline magmas of KGI were all generated in an upper mantle modified by addition of small amounts of pelagic sediments dragged down by subduction processes. (Auth.)

E-44663

Jerzmańska, A., **First articulated teleost fish from the Paleogene of West Antarctica**, *Antarctic science*, Sep. 1991 3(3), p.309-316, Refs. p.315-316.

Marambionella andreae gen. et sp. nov. from the La Meseta Formation (Upper Eocene-Lower Oligocene) on Seymour I. is the first fossil clupeid found in Antarctica and the first articulated teleost from the Antarctic Paleogene. It shows a mosaic of similarities and differences compared with various clupeid genera. This and the uncertainty about the polarity of characters within clupeids do not allow precise assessment of the phylogenetic relationships of *Marambionella*. (Auth.)

E-44665

Ward, D.J., Grande, L., **Chimaeroid fish remains from Seymour Island, Antarctic Peninsula**, *Antarctic science*, Sep. 1991 3(3), p.323-330, 22 refs.

Ischyodus dolloi Leriche 1902, the youngest record of the species, and *Chimaera seymourensis* sp. nov. are described from the La Meseta Formation, Late Eocene of Seymour I., Antarctic Peninsula. (Auth.)

E-44666

Hooker, J.J., Milner, A.C., Sequeira, S.E.K., **Ornithopod dinosaur from the Late Cretaceous of West Antarctica**, *Antarctic science*, Sep. 1991 3(3), p.331-332, 15 refs.

In Feb. 1989, the partial skeleton of an ornithopod dinosaur was discovered during a British Antarctic Survey expedition to the James Ross I. area, east of the Antarctic Peninsula. This was only the second dinosaur to be found in the continent of Antarctica, the first being an ankylosaur collected three years earlier. This new antarctic find extends the temporal and paleogeographic range, and the diversity of southern high latitude ornithopod dinosaurs, from that described by Rich and Rich (1989) in the Early Cretaceous of southeastern Australia.

E-44711

Sandy, M.R., **Cretaceous brachiopods from James Ross Island, Antarctic Peninsula, and their paleobiogeographic affinities**, *Journal of paleontology*, May 1991 65(3), p.396-411, Refs. p.410-411.

Articulate brachiopods from the Aptian-Coniacian (Kotick Point and Whisky Bay Formations, Gustav Group) and the Santonian-Campanian (Santa Marta Formation, Marambio Group) of James Ross I. are described. A new terebratulid species, *Rectithyris whiskyi* n. sp., is described from the late Albian-early Coniacian of the Whisky Bay Formation. The record from the late Albian is supported by palynological evidence making it contemporaneous with other species of *Rectithyris* from Europe. The relative abundance of *Rectithyris whiskyi* n. sp. in late Turonian to early Coniacian sections indicates an extended biohorizon that may aid biostratigraphic correlation in the James Ross I. region. A distinct austral brachiopod fauna may be present in the Cretaceous from the Aptian onwards (although current evidence is scant). Antarctic Peninsular and Western Australian faunas yield five brachiopod genera (and their species) endemic to Gondwanaland's southern marine fauna. Other genera known from the Antarctic Peninsula (*Kingena*, *Ptilorhynchia*, and *Rectithyris*) and the Northern Hemisphere may have species endemic to Gondwanaland. (Auth. mod.)

E-44712

Gillieson, D.S., **Environmental history of two freshwater lakes in the Larsemann Hills, Antarctica**, *Hydrobiologia*, May 31, 1991 Vol.214, p.327-331, 9 refs.

The Larsemann Hills are a series of rocky peninsulas and islands in Prydz Bay. There are about 2000 sq km of ice free land with well over 150 freshwater lakes spread evenly over the granite and gneiss hills. The nearshore islands were ice free by 9500 BP, while the present coastline was exposed by 4500 BP. A relatively steady rate of ice retreat is indicated, around 0.3/ma. The two freshwater lakes studied so far have evolved from oligotrophic, proglacial lagoons to fresh or brackish lakes affected by periodic influxes of salt water from sea spray and surges produced by glacial calving. The diatom assemblages increase in species diversity following marine incursion or influence. The major changes are therefore due to the postglacial recovery of sea level, rather than any intrinsic chemical evolution of the lake waters. (Auth.)

E-44720

Ferris, J.M., Gibson, J.A.E., Burton, H.R., **Evidence of density currents with potential to promote meromixis in ice-covered saline lakes**, *Palaeogeography, palaeoclimatology, palaeoecology*, May 15, 1991 81(1-4), p.99-107, 33 refs.

In the Vestfold Hills' saline lakes, progressive growth of ice volume through the austral winter and spring months generates haline convection capable of mixing the water column to a depth at least as great as that achieved by wind-induced turbulence in the summer ice-free period. Further, cold and very saline brines may form at the shallow periphery of a lake and flow downslope, penetrating to the lake center below the convectively mixed layer. Detailed temperature profiles of hypersaline Organic Lake provide the first evidence for these density currents in saline lakes of the Vestfold Hills. These data indicate a dynamic response to periods of relatively cold weather, and that the resulting density currents may be sufficiently small in volume to have little effect on the anoxia of bottom layers in these meromictic lakes. Alternating periods of negative and positive water balance may also be significant in the formation and destruction of meromixis in these saline lakes, which lack outflow streams. If a lake has been through a period of negative water balance, becoming more saline, and then begins to be diluted during a subsequent period of positive water balance, the winter haline convection will penetrate to progressively shallower depths, and deeper layers may stagnate, marking the onset of meromixis. An increase in the water level of Organic Lake over ten years indicates the speed with which the Vestfold Hills' lakes may experience significant change in salinity, despite the generally small catchments of these lakes. (Auth.)

E-44721

Bird, M.I., Chivas, A.R., Radnell, C.J., Burton, H.R., **Sedimentological and stable-isotope evolution of lakes in the Vestfold Hills, Antarctica**, *Palaeogeography, palaeoclimatology, palaeoecology*, May 15, 1991 81(1-4), p.109-130, 56 refs.

Sections of the cores deposited in three saline lakes and two inlets in the Vestfold Hills area are characterized by uniform, regularly laminated, fine-grained, organic-rich sediments, with uniform organic $\delta^{13}C$ values (-18.0 to -19.4 per mill vs. PDB) and sulfur contents. In contrast, sediments deposited in lacustrine environments are extremely heterogeneous, varying from finely laminated mat-like sequences to poorly sorted clastic-rich sediments. Authigenic monohydrocalcite and aragonite occur in some lake sediments. The $\delta^{13}C$ values of organic matter in the lacustrine sediments exhibit an extremely wide range (-10.5 to -25.3 per mill) that can be related to variations in physico-chemical conditions in the lake waters. Strongly negative organic- $\delta^{13}C$ values coupled with high sulfur

contents are indicative of an anoxic zone in the overlying lake waters, whereas less negative organic- $\delta^{13}\text{C}$ values coupled with low sulfur contents are indicative of well-mixed oxic conditions. The $\delta^{13}\text{C}$ composition of authigenic carbonate in hypersaline Organic Lake sediments provides a record of changes in palaeoproductivity, while the $\delta^{18}\text{O}$ of the carbonate provides information on rates of meltwater input and evaporation in the lake. C-14 dating suggests that Highway Lake was isolated from the sea by isostatic uplift at least 4600 yr B.P., whereas Organic Lake was isolated at approximately 2700 yr B.P. Apparent emergence rates calculated from the C-14 ages range from 1.0 to 2.1 mm/yr. The 'reservoir effect' in the lacustrine and marine environments is variable, but probably does not exceed about 1000 yr in any of the lakes examined. (Auth. mod.)

E-44722

Gibson, J.A.E., Garrick, R.C., Franzmann, P.D., Deprez, P.P., Burton, H.R., **Reduced sulfur gases in saline lakes of the Vestfold Hills, Antarctica, Palaeogeography, palaeoclimatology, palaeoecology**, May 15, 1991 81(1-4), p.131-140, 36 refs.

A survey of reduced sulfur gases in the lakes of the Vestfold Hills was undertaken to elucidate the environmental factors affecting the distribution of these compounds. The oxygenated water of all lakes was found to contain low levels of dimethylsulfide (DMS) (0-30 nM) and no other sulfur compounds. The meromictic lakes show considerable variation in the speciation and concentration of the reduced sulfur compounds present in the anoxic bottom water. Meromictic lakes of low salinity (<80 per mill) possessed anoxylinia nearly devoid of dimethylsulfide (DMS) but with high concentrations of H_2S . In these lakes it appeared that rates of degradation of DMS were as fast as production. Lakes of intermediate salinity (80-185 per mill) had high concentrations of both sulfur species, while lakes of salinity greater than 185 per mill had no H_2S but high concentrations of DMS. The absence of hydrogen sulfide was attributed to the absence of sulfate-reducing bacteria. The observed DMS concentrations were the result of the balance between the production and degradation of DMS by bacteria. At high salt concentrations either the degradation processes became relatively less efficient or more DMS was produced in response to increased salinity. (Auth.)

E-44724

Livermore, R.A., Tomlinson, J.S., Woollett, R.W., **Unusual sea-floor fabric near the Bullard fracture zone imaged by GLORIA sidescan sonar**, *Nature*, Sep. 12, 1991 353(6340), p.158-161, 34 refs.

The tectonic fabric of the sea floor created at spreading ridges generally curves in the direction of ridge offset near transform faults, owing to the influence of shearing stress on transform faults. New GLORIA sidescan sonar images from the South American-Antarctic Ridge show fabric to the north of the Bullard transform with a reversed sense of curvature. This curvature, and that observed in an area of older sea floor near the eastern ridge-transform intersection, appears to result from postemplacement deformation, caused by the transmission of shear stresses across transforms. The deformation was probably related to a major Early Miocene change in spreading direction, which would have imposed a component of compression on the transforms. Such a sense of curvature has not been observed elsewhere on the deep ocean floor, although apparently similar patterns have been reported in ophiolites. (Auth.)

E-44729

Thiesen, Z.V., Corbellini, L.M., Leipnitz, I.I., Gruber, N.L.S., Horn Filho, N.O., **Foraminifera from surface sediments of Admiralty Bay, King George I.** [Foraminíferos dos sedimentos superficiais da Baía do Almirantado, Ilha Rei George, Antártica], Congresso Brasileiro de Geologia, 36th, Natal, RN, Oct. 28-Nov. 1, 1990. Anais, Vol.2, [Brazil, Sociedade Brasileira de Geologia, 1991], p.588-603, In Portuguese with English summary. Refs. p.595-596.

The foraminifera included in 43 surface samples of Admiralty Bay ocean floor (mud, muddy sand, sandy mud, mud with gravel and mud with sand and gravel) were analyzed. Peak values of species diversity were observed in samples at depths oscillating between 110 and 250 m. These values didn't increase at greater depth. In most samples, the dominant suborder was Rotaliina, followed by Textulariina. The most frequent and constant species were *Globocassidulina subglobosa*, *G. bitor* and *Cassidulinoides parkerianus*. *Globocassidulina subglobosa* was the dominant species. *Neoglobobulimina pachyderma* was the only planktonic species registered. (Auth. mod.)

E-44734

Bachi, F.A., Horn Filho, N.O., Ayup Zouain, R.N., Dillenburg, S.R., **Beach morphology and sedimentation of Fildes Peninsula, King George I., and Stinker Point, Elephant I., Antarctic Peninsula** [Observacoes da morfologia e sedimentacao nas praias da Península Fildes, Ilha Rei Jorge e Stinker Point, Ilha Elefante, Península Antártica], Congresso da Associacao Brasileira de Estudos do Quaternário, 1st, Porto Alegre, RS, July 6-12, 1987. Anais, Porto Alegre, 1987, p.325-333, In Portuguese with English summary. 7 refs.

Characteristic features of the beaches on Fildes Peninsula and Stinker Point consist of terraces of marine origin, with grayish sediments of varied granulometry interlaced with grayish, coarse, angular and unselected glacial and periglacial deposits. The terraces' maximum heights reach 15 m on Fildes Peninsula and 11 m on Stinker Point, relative to present sea level. The glacial and marine accumulations are worked over by periglacial agents, deicing waters, resulting in erosive and depositional features along the coast. The presence of small isles and frequent icebergs condition the wave behavior, affecting beach morphology and sedimentation. The main source area for shoreline sediments is made up by prevailing rocks on King George and Elephant Islands, namely volcanic and metamorphic rocks, respectively. (Auth. mod.)

E-44736

Miller, H., ed, **Workshop on antarctic geochronology, Munich 1989, Zentralblatt für Geologie und Paläontologie, Teil I**, July 1990 No.1/2, p.1-180, Refs. passim.

Sixty scientists met in Munich in Apr. 1989 to discover the state of the knowledge of isotope geochronology. The workshop resulted in the 14 papers joined in this volume; some deal with recent research, others have the character of review articles. The topics include: zircon geochronology; isotopic data; granitic basement intrusives in north Victoria Land; xenoliths and stratigraphy from the northern Antarctic Peninsula; Shetland Islands; Rb-Sn age data from Clarence Island; volcanic suites and glacial and interglacial successions on King George Island; sediments in Bransfield Strait, and Cretaceous rifting in the southern Kerguelen region.

E-44737

Beliatskiĭ, B.V., Krylov, D.P., Levskiĭ, L.K., Grikurov, G.E., **Zircon geochronology of the granulite complexes of Enderby Land, East Antarctica**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.1-18, With German summary. 26 refs.

New isotopic data for zircons are presented for the ancient Napier complex granitoids using a direct evaporation technique. Conventional U-Pb analysis was also carried out on selected zircon fractions from Aker Peaks, Wilkinson Peaks, and Doggers Nunataks, some of which were subjected to air-abrasion. The results help to elucidate the early tectonothermal history of crustal evolution of this region as follows. Continental crust may have initially formed prior to a first stage of granulite metamorphism of the Napier complex protolith about 3500 Ma ago. The second structural episode in the Napier complex was also accompanied by high-grade granulite facies metamorphism: the data suggest a single event at 2900-3100 Ma. The next widespread event affected the Napier complex in the Late Archean about 2500 Ma ago; metamorphic grade was transitional between amphibolite and granulite facies. In the Rayner complex the formation of initial continental crust can be traced as far back as 2900 Ma. The latest event, recorded in the U-Pb system of most zircons from both complexes, corresponds to Paleozoic activity at 550-500 Ma. (Auth.)

E-44738

Moyes, A.B., Barton, J.M., Jr., **Review of isotopic data from western Dronning Maud Land, Antarctica**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.19-31, With German summary. 33 refs.

Radiogenic isotope data from western Dronning Maud Land indicate that the Ahlmannryggen-Borgmassivet is a cratonic fragment of partly Archean basement, and dominantly a mid- to late-Proterozoic sedimentary-volcaniclastic sequence intruded by late-Proterozoic mafic sills. The Kirwanveggen-H.U. Sverdrupfjella represent a younger mobile belt, comprising late-Proterozoic metamorphic rocks, intruded by a number of igneous bodies. Both terrains experienced a tectono-thermal event at approximately 1100-1000 Ma, although the craton suffered only low-grade metamorphism and hydrothermal alteration whereas the mobile belt was subjected to high grade metamorphism. After this event, the craton stabilized, whereas the mobile belt remained active, culminating in another event at approximately 480-450 Ma. (Auth. mod.)

E-44739

Morton, J.B., Jr., Moyes, A.B., **Cooling patterns in western Dronning Maud Land, Antarctica, and southeastern Africa and their implications to Gondwana**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.33-43, With German summary. 31 refs.

Temperature-time (T-time) paths, determined from emplacement ages of igneous rocks and blocking temperatures of various minerals in different isotopic systems, are presented for crustal elements in western Dronning Maud Land, and in southeastern Africa. There are great differences among these paths. In a Gondwana reconstruction, the southernmost place in southeastern Africa where the pattern defined by T-time paths in western Dronning Maud Land can be matched is adjacent to northern Mozambique. If this match is correct, then the supracrustal sequence of the Ahlmannryggen-Borgmassivet may be correlated with the rocks of the Umkondo group, and the metamorphic rocks of the Sverdrupfjella and Kirwanveggen would correlate with the rocks of the Mozambique belt. Fragments of the

Limpopo belt and the eastern Kaapvaal craton have not been identified in western Dronning Maud Land, possibly because of pre-Gondwana fragmentation of these terranes. (Auth.)

E-44740

Felder, R.P., Faure, G., **Age and petrogenesis of the granitic basement rocks, Brown Hills, Transantarctic Mountains**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.45-62, 17 refs.

The granitic basement rocks of the Brown Hills, located north of the Darwin Glacier at about 79 deg 45'S and 159E, consist of three major mappable units: the Carlyon Granodiorite, the Mt. Rich Granite, and Leucocratic Granite. The latter occurs in the form of dikes and pegmatites, whereas the former constitute the bulk of the granitic batholith between the Darwin and Carlyon Glaciers. Age determinations of various rock samples were made using Rb-Sr or Ar-40/Ar-39 measurements and Sr-87/Sr-86 ratios were calculated. The differences in the ages and initial Sr-87/Sr-86 ratios provide strong evidence against the derivation of the intrusives by fractional crystallization of a single homogeneous magma. Rare earth concentrations and delta O-18 values support the hypothesis that the Carlyon and Mt. Rich magmas formed from sedimentary and volcanic protoliths. The Leucocratic Granite may have originated either by remelting of Carlyon-Mt. Rich rocks or it may be a product of differentiation of a mixture of residual silicate liquids at the end of a magmatic process that lasted about 48 Ma during which time magmatic temperatures decreased 358 C. The results obtained from this study support the conclusion that the Ross Orogeny of the Transantarctic Mountains occurred along a subduction zone at the margin of the East Antarctic craton. (Auth. mod.)

E-44741

Armienti, P., **Granite Harbour intrusives from north Victoria Land between David and Campbell Glaciers: new geochronological data**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.63-74, With German summary. 17 refs.

The Granite Harbour intrusives are mainly late-post-tectonic and display a composition ranging from diorite to syenogranite; the outcrops studied were divided into two groups: the South Victoria Land Intrusives (SVLI) and the Terra Nova Batholith within which Deep Freeze Range Intrusives and Mt. Abbott Intrusives are also identified. Ages and Sr-87/Sr-86 ratios are determined for whole rock and biotite samples; ages range from 443 Ma to 508 Ma. The long time span between the emplacement age of Mt. Abbott Intrusives and the closure age of micas, that are the same in both granitoid rocks and migmatites, is thought to be due to regional uplift. Differences in biotite closure ages between Terra Nova Batholith and SVLI are interpreted as a diachronous uplift of the two crustal sectors. (Auth. mod.)

E-44742

Adams, C.J., Weaver, S.D., **Age and correlation of metamorphic basement in Edward VII Peninsula, Marie Byrd Land, West Antarctica, and correlation with northern Victoria Land and southern New Zealand**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.75-86, With German summary. 22 refs.

K-Ar total-rock ages and Rb-Sr whole-rock data are reported for metamorphic basement on Edward VII Peninsula, Marie Byrd Land. Younger K-Ar ages from the Swanson Formation low-grade metasediments, 100-114 Ma, reflect a local thermal overprint associated with

the Byrd Coast Granite (Cretaceous) but the maximum age, 451 Ma is a minimum age for earlier regional metamorphism and cleavage formation. The age patterns are similar to those in the Ford Ranges, Marie Byrd Land and West Coast, South Island, New Zealand. Rb-Sr whole-rock data of schists and paragneisses from the Alexandra Metamorphic Complex do not yield isochron ages and reflect incomplete strontium isotope homogenization of precursor sediments during metamorphism. However, the data exclude an early Paleozoic-Pre-cambrian age and rather support a mid-Cretaceous age correlating with similar complexes in Marie Byrd Land (Fosdick Mts.) and South Island, New Zealand. (Auth.)

E-44743

Loske, W., Miller, H., Milne, A., Herve, F., **U-Pb zircon ages of xenoliths from Cape Dubouzet, northern Antarctic Peninsula**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.87-95, With German summary. 18 refs.

The discovery of large boulders (up to 0.6 m) of metamorphic xenoliths (amphibolite, plagioclase-biotite gneiss and metatonalite) in a Mesozoic granitoid in a moraine at Cape Dubouzet has allowed a study to be made of previously unknown medium-grade basement lithologies of the northern Antarctic Peninsula which may underlie the Trinity Peninsula Group (TPG). The majority of the zircon crystals from the granitoid host rock are euhedral, prismatic and colorless. U-Pb analysis of these zircons yields a rather imprecise Triassic-Jurassic age interpreted as the time of emplacement of this intrusive. The zircons from the metatonalite xenoliths are mostly colorless to slightly yellow and contain abundant opaque and translucent inclusions. Seven grain-size fractions (ranging from <42 microns to >125 microns) define a reference line (MSWD 1.5) which intersects the concordia at $291 \pm 24/-26$ Ma and $1698 \pm 88/-82$ Ma. The Late Carboniferous lower intercept date is considered to be a minimum age for the basement of northern Antarctic Peninsula. (Auth.)

E-44744

Millar, I.L., Milne, A.J., Whitham, A.G., **Implications of Sm-Nd garnet ages for the stratigraphy of northern Graham Land, Antarctic Peninsula**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.97-104, With German summary. 13 refs.

Terrestrial sedimentary rocks of the Botany Bay Group (BBG) occupy an important position in the stratigraphy of northern Antarctic Peninsula. They unconformably overlie Trinity Peninsula Group (TPG) metasedimentary rocks and are conformably overlain by the Antarctic Peninsula Volcanic Group (APVG). A fossil flora is preserved, but the assignment of an age to these beds has proven difficult, with estimates ranging from Middle Jurassic to Early Cretaceous. An Sm-Nd age of about 152 Ma from garnets extracted from an andesitic sill within the APVG at Camp Hill dates emplacement of the sill. Sm-Nd analyses of BBG detrital garnet fractions and a garnet-bearing andesite from Tower Peak plot together with the Camp Hill samples on a single isochron, yielding an age of 156 Ma. Deposition of the BBG sediments must have occurred penecontemporaneously with APVG volcanism during Late Jurassic times. Juxtaposition of the coarse, fluvial BBG sedimentary rocks with the Upper Jurassic marine hemipelagic Nordenskjöld Formation can be explained by strike-slip movements during Late Jurassic to Early Cretaceous times. (Auth.)

E-44745

Trouw, R.A.J., Pankhurst, R.J., Kawashita, K., **New radiometric age data from Elephant Island, South Shetland Islands**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.105-118, With German summary. 23 refs.

Forty-eight new Rb-Sr isotopic analyses of metamorphic rocks are presented. Metapelites from northern Elephant I. show evidence for equilibration at around 80-120 Ma. Low initial Sr-87/Sr-86 ratios suggest that the protolith of these rocks cannot be very much older. Data from southern Elephant I. suggest incorporation of older continent derived-clastic fragments within an accretionary complex which is otherwise of dominantly oceanic affinity. Twenty-eight Sm-Nd analyses suggest that mafic schists throughout the Elephant I. Group are metamorphosed intra-oceanic igneous rocks. Fourteen new K-Ar analyses confirm that the peak of metamorphism was probably attained shortly before 110 Ma. There is no sharp break in either pre-Cretaceous history or subsequent evolution between northern and southern parts of the island, and the use of the terms Terrane A and Terrane B should be discontinued. (Auth.)

E-44746

Herve, F., Miller, H., Loske, W., Milne, A., Pankhurst, R.J., **New Rb-Sr age data from the Scotia metamorphic complex of Clarence Island, West Antarctica**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.119-126, With German summary. 8 refs.

Nine samples of grey phyllite from the southwestern part of Clarence I., between Chinstrap Cove and Craggy Point, have been analyzed by the Rb-Sr whole rock method. Six of the samples define a 98 Ma isochron (MSWD=1.6) with an initial Sr-87/Sr-86 ratio of 0.7065. This age is similar to that of the last (D2) metamorphic episode at Cape Lookout on nearby Elephant I. However, in the Clarence I. rocks there is also isotopic evidence of the previous history of the metamorphic complex, indicated by a 206 Ma errorchron (MSWD=26; initial Sr-87/Sr-86=0.7055) for the complete set of samples. The polymetamorphic evolution of the complex apparently occurred here without complete Rb-Sr re-equilibration on the scale of some cubic meters, the size of the sampling area. (Auth.)

E-44747

Birkenmajer, K., Soliani, E., Kawashita, K., **Reliability of potassium-argon dating of Cretaceous-Tertiary island-arc volcanic suites of King George Island, South Shetland Islands (West Antarctica)**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.127-140, With German summary. 25 refs.

The geochronology of calc-alkaline subduction-related island-arc volcanic-sedimentary suites of King George I. is based mainly on K-Ar dating of lavas and associated hypabyssal and plutonic intrusions. The age range of stratiform volcanic-sedimentary piles is from Late Cretaceous through Early Miocene. The most reliable K-Ar data was obtained from lava sheets unaffected by reheating due to later intrusive activity in the Warszawa Block (King George I. Supergroup); less reliable results were obtained from lava sheets densely crossed by younger plugs and dykes in the Kraków Block (Kraków Icefield Supergroup). Metasomatized (chloritized, carbonatized) volcanic complexes of axial Barton Horst yield K-Ar dates unrelated to stratigraphic succession (Martel Inlet Group) or partly conformable with Rb-Sr dating (Cardozo Cove Group). Three major thermal events responsible for reheating of lava complexes and partial argon loss have been determined: (1) at about 68 Ma, possibly related to Gondwanaland break-up between Antarctica and South America; (2) at 44-41 Ma,

possibly reflecting initial opening of the Drake Passage; and (3) at 22-20 Ma, corresponding to the initial rifting of the Bransfield Strait. (Auth.)

E-44748

Birkenmajer, K., **Geochronology and climatostratigraphy of Tertiary glacial and interglacial successions on King George Island, South Shetland Islands (West Antarctica)**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.141-151, With German summary. 32 refs.

Four Tertiary glaciations separated by three interglacial phases have been distinguished on King George I., based on K-Ar and biostratigraphic dating. These are: the Kraków Glaciation (Early Eocene); the Arctowski Interglacial (Middle Eocene-Early Oligocene); the Polonez Glaciation (mid-Oligocene); the Wesele Interglacial (Late Oligocene); the Legru Glaciation (Late Oligocene); the Wawel Interglacial (Oligocene-Miocene boundary); and the Melville Glaciation (Early Miocene). There still remain unsolved problems as to the exact geological age of some glacial and interglacial-type sediments. (Auth.)

E-44749

Matthies, D., Mäusbacher, R., Storzer, D., **Deception Island tephra: a stratigraphical marker for limnic and marine sediments in Bransfield Strait area, Antarctica**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.153-165, With German summary. 23 refs.

Eighteen ash-layers from five limnic sediment cores from King George I. were tested by bulk chemical composition in order to establish a correlation between tephrostratigraphy and -chronology for the Bransfield Strait area. Four eruption episodes of Deception I. volcano were identified in several sediment cores. Radiometrically dated core sections determined their ages as 3.1 to 3.9, 4.0 to 4.5, 5.2 and 8.7 ka B.P., respectively. The correlation of the oldest ash-layers suggests a verified model for deglaciation with two periods of rapid ice retreat, prior 9 ka B.P. and later 6 ka B.P. Two tephra-horizons in marine sediments from Bransfield Strait could be correlated with limnic ashes, thus giving the first absolute time markers for the marine sediments, whose ages are 3.1 to 3.9 and 5.2 ka B.P. (Auth.)

E-44750

Bassias, Y., Leclaire, L., **Early Cretaceous rifting between the southern Kerguelen and the Naturalist Plateau. Petrographic and stratigraphic evidence**, *Zentralblatt für Geologie und Paläontologie, Teil I*, July 1990 No.1/2, Workshop on antarctic geochronology, Munich 1989, edited by H. Miller, p.167-180, With German summary. 28 refs.

Comparative petrography and stratigraphy in the incipient Cretaceous southeast Indian Ocean indicate that both source variations of the basaltic basement and first appearance of marine conditions are temporarily transgressive from Naturalist Plateau towards Kerguelen Plateau. These features are consistent with rifting being controlled by lithospheric delamination rather than by symmetric extension, and suggest that Southern Kerguelen Plateau, during Middle Cretaceous, was the leading edge of the progressively unloaded Australian Plate relative to India. (Auth.)

E-44752

Zhu, C., Cui, Z.J., **Structural characteristics of cryosphere on Fildes Peninsula, King George Island, West Antarctica**, *Antarctic research*, 1990 2(4), p.1-10, In Chinese with English summary. 12 refs.

Data from pitting, geoelectrical prospecting, temperature measurements and analysis of ice water content and salinity indicate that the permafrost table of Astrofix Hill on Fildes Peninsula is found at 1.5 m depth, increasing or decreasing from 0.3 to 0.5 m with the altitude of the hilltop. The structure of the cryosphere consists of 5 layers: active, frozen sand gravel, frozen volcanic rock permeated by sea water, frozen volcanic rock not permeated by sea water, and unfrozen ancient continental base. The permafrost thickness ranges from 80-150 m. (Auth. mod.)

E-44755

Zheng, X.S., **First report on the volcanic geology of Stansbury Peninsula, Nelson Island, West Antarctica**, *Antarctic research*, 1990 2(4), p.28-35, In Chinese with English summary. 8 refs.

The Stansbury Peninsula on Nelson I., a neighbor of Fildes Peninsula on which the Great Wall Station is located, is covered with basaltic, basalt-andesitic lavas and breccias as well as fossiliferous volcanic-sedimentary clastic rocks. The volcanic rocks and volcanic-sedimentary clastic rocks are the products of 2 stages of volcanism and can be stratigraphically subdivided into 3 members. In the first stage, agglomerates and breccias, interbedding basaltic, basalt-andesitic lavas and breccias formed successively, and are comparable to those of Jasper Hill and Agate Beach Members on Fildes Peninsula. Before the end of this stage, some subvolcanic intrusives appeared. The flora-bearing volcanic sedimentary clastic rocks, belonging to the Fossil Hill Member as found on Fildes Peninsula, represent a long time break in volcanic activities on the peninsula. Agglomeratic lavas and breccia on the volcanic sediments near the east coast of the peninsula show that the center of volcanic activities of the second stage had migrated eastwards. Similar development of volcanic strata and the discovery of plant fossils provide evidence that the volcanic rocks on Stansbury Peninsula and on Fildes Peninsula resulted from the same regional volcanism in the Early Tertiary. The faults on the peninsula parallel to the Fildes Strait Fault are the main structure, and control the distribution of subvolcanic intrusives on the peninsula. (Auth. mod.)

E-44756

Cheng, X.H., Zhang, H.S., Xia, W.P., **Anomaly of fluorine in a sedimentary system, western antarctic ocean**, *Antarctic research*, 1990 2(4), p.36-44, In Chinese with English summary. 14 refs.

The fluorine content in bulk sediment and the pore water in the western antarctic ocean is 200-395 micrograms/g and 1.18 to 1.92 micrograms/ml, respectively, far below the average reported for the world oceans: 540 micrograms/g and 2.7 micrograms/ml, respectively. The distribution of fluorine in sediments of the western antarctic ocean is controlled by the chemical composition of the material from the islands in the area. The element seems to be incorporated by the hornblende to a great extent, thus the correlation between the element and the hornblende amount in the sediments can be expressed statistically as follows: $F = 217 + \ln V_h$. The low concentration of fluorine in the pore water is largely due to the weak weathering process on the islands and the precipitation of the element with calcium. The decomposition of organic matter in the sediment also provides fluorine to the pore water. (Auth. mod.)

E-44764

Meeker, K.A., Chuan, R.L., Kyle, P.R., Palais, J.M.,
Emission of elemental gold particles from Mount Erebus, Ross Island, Antarctica, *Geophysical research letters*, Aug. 1991 18(8), p.1405-1408, 29 refs.

Volcanoes are an important source of gases and aerosols in the atmosphere. Significant quantities of trace elements are emitted as vapor species and are strongly enriched in the gas relative to the magma. After eruption the trace elements condense on ash and other particles or they form sublimates and agglomerates. The emission of gold (Au) from Mount Erebus is reported here. Although the flux of emitted Au is low compared to other volcanoes, crystalline particulate Au has been found in the plume near the crater, in ambient air up to 1000 km from the volcano and in near surface samples. Vapor phase transport of Au may occur as a chloride species and could be an important transport mechanism in crystallizing magmatic intrusions. (Auth.)

E-44768

Miyamoto, M., **Thermal metamorphism of CI and CM carbonaceous chondrites: an internal heating model, *Meteoritics*, June 1991 26(2), p.111-115, 30 refs.**

Infrared diffuse reflectance spectra were measured for several thermally metamorphosed carbonaceous chondrites with CI-CM affinities which were recently found in Antarctica. Compared with other CI or CM carbonaceous chondrites, these antarctic carbonaceous chondrites show weaker absorption bands near 3 microns due to hydrous minerals, and weaker absorption bands near 6.9 microns due to carbonates, interpreted as thermal metamorphic features. These absorption bands also disappear in the spectra of samples of the Murchison (CM) carbonaceous chondrite heated above 500 C. Model calculations were performed to study thermal metamorphism of carbonaceous chondrites in a parent body internally heated by the decay of the extinct nuclide Al-26. The maximum temperature of the interior of a body more than 20 km in radius is 500-700 C for the bulk Al contents of CI and CM carbonaceous chondrites, assuming a ratio of Al-26/Al-27 = 0.000005 which has been previously proposed for an ordinary-chondrite parent body. The metamorphic temperatures experienced by the antarctic carbonaceous chondrites considered here may be attainable by an internally heated body with an Al-26/Al-27 ratio similar to that inferred for an ordinary-chondrite parent body. (Auth.)

E-44769

Takeda, H., Graham, A.L., **Degree of equilibration of eucritic pyroxenes and thermal metamorphism of the earliest planetary crust, *Meteoritics*, June 1991 26(2), p.129-134, 22 refs.**

The pyroxenes in two new monomict eucrites from Antarctica, Yamato 791186 and Yamato 792510, have been studied and compared with those of other antarctic and non-antarctic eucrites. The purpose of this study is to identify compositional and textural relationships shown by these pyroxenes which may be used as indicators of the thermal history of the meteorite. An attempt is made, using petrographic and compositional criteria, to distinguish between the initial cooling history and subsequent thermal events. It seems possible to identify stages of thermal "metamorphism" which may be used to indicate the conditions on the surface and crust of the parent body. A picture of the geological setting of the HED (Howardites, Eucrites, Diogenites) parent body is proposed, for which thermal metamorphism by impact heating is an important process. (Auth.)

E-44770

Benoit, P.H., Sears, H., Sears, D.W.G.,
Thermoluminescence survey of 12 meteorites collected by the European 1988 antarctic meteorite expedition to Allan Hills and the importance of acid washing for thermoluminescence sensitivity measurements, *Meteoritics*, June 1991 26(2), p.157-160, 16 refs.

Natural and induced thermoluminescence (TL) data are reported for 12 meteorites recovered from the Allan Hills region of Antarctica by the European field party during the 1988/89 field season. The samples include one with extremely high natural TL, ALH88035, suggestive of exposure to unusually high radiation doses (*i.e.*, low degrees of shielding), and one, ALH88034, whose low natural TL suggests reheating within the last 100,000 years. The remainder have natural TL values suggestive of terrestrial ages similar to those of other meteorites from Allan Hills. ALH88015 (L6) has induced TL data suggestive of intensive shock. TL sensitivities of these meteorites are generally lower than observed falls of the petrologic types, as is also observed for antarctic meteorites in general. Acid washing experiments indicate that this is solely the result of terrestrial weathering rather than a nonterrestrial antarctic-non-antarctic difference. However, other TL parameters, such as natural TL and induced peak temperature width, are unchanged by acid washing and are sensitive indicators of a meteorite's metamorphic and recent radiation history. (Auth.)

E-44784

Fitzgerald, P.G., Stump, E., **Early Cretaceous uplift in the Ellsworth Mountains of West Antarctica, *Science*, Oct. 4, 1991 254(5028), p.92-94, 29 refs.**

Apatite fission-track analysis of samples covering a 4.2 km vertical section from the western flank of Vinson Massif, Antarctica's highest mountains, indicates that the Ellsworth Mountains were uplifted by 4 km or more during the Early Cretaceous following the initial separation of East and West Gondwana and accompanying the opening of the Weddell Sea. Relief of at least 1.8 km has persisted in the Ellsworth Mountains since the Early Cretaceous, and a maximum of 3 km of uplift has occurred since that time. (Auth.)

E-44789

Quilty, P.G., **Significance of evidence for changes in the antarctic marine environment over the last 5 million years, Antarctic ecosystems: ecological change and conservation. Edited by K.R. Kerry and G. Hempel, Berlin, Springer-Verlag, 1990, p.3-8, 24 refs.**

Recent discoveries in the Vestfold Hills, in the Larsemann Hills and near the South Pole, of fossil vertebrates, microfossils and wood in Pliocene sediments all indicate that Antarctica was considerably warmer at various times in the Pliocene than at present. However, data are sparse, the results very tentative, and there is conflict in places between onshore and offshore evidence. Results suggest that changes towards the present glacial regime were later and more rapid than had been envisaged earlier. While the above examples provide some firm data on Pliocene paleoenvironments, other studies, for example of diatoms from sediments near Casey Station, provide tantalizing glimpses of support for the concept of warm environments. (Auth.)

E-44844

Simonov, I.M., **Geographic observations of Lake Unter-See [Geograficheskie nabliudeniia v oazise Unter-Ze], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.135-153, In Russian. 17 refs.**

The location, geography, morphology, climate, dimensions, ice cover features and water characteristics of Lake Unter-See are de-

scribed. Charts and tables are presented with the morphometric characteristics and profiles of the lake, contrasted with those of Lake Ober-See as control. Moraines found by the 28th and 29th Soviet antarctic expeditions in the region are discussed in detail. One of these of particular interest, and located in the southwestern corner of the lake next to the Anuchin Glacier, consists of rocks 2-3 m in diameter, unlike those found elsewhere in the lake. Discussion centers on the possible processes contributing to the formation of the moraines.

E-44852

Grünig, S., **Quaternary sedimentation processes on the continental margin of the South Orkney Plateau, northwestern Weddell Sea (Antarctica)** [Quartäre Sedimentationsprozesse am Kontinentalhang des Süd-Orkney-Plateaus im nordwestlichen Weddellmeer (Antarktis)], *Berichte zur Polarforschung*, 1991 No.75, 196p., In German with English summary. Refs. p.117-125.

Grab samples and cores for sedimentological studies were retrieved along a N-S transect of the South Orkney Plateau margin. On the basis of morphology, the margin has been subdivided into shelf, upper continental slope, and a lower slope region cut by basins and ridges. Grain size, sand component, and clay mineralogy were determined as well as water, organic carbon and carbonate contents. In addition, vane shear strength, magnetic intensity and the proportion of ice-rafted debris were measured. Dating was done by detailed magnetic stratigraphy, the biofluctuation of the radiolarian *Cycladophora davisiana* and 230-Thorium analyses. Sediment facies distribution is controlled by numerous factors such as regional bathymetry and circulation, biogenic productivity, seasonal ice cover and the deposition of terrigenous detritus by ice-rafting, bottom water transport and/or slumping. The complex interrelationship between these factors results in three main categories of sediment facies. Diamict facies, homogeneous clay facies, and bioturbated facies are described and discussed. (Auth. mod.)

E-44856

Brown, E.T., **Examination of surface exposure ages of antarctic moraines using *in situ* produced Be-10 and Al-26**, *Geochimica et cosmochimica acta*, Aug. 1991 55(8), p.2269-2283, 60 refs.

A suite of samples from antarctic moraines with a wide range in exposure times (approximately 30 to approximately 2500 Ky) has been analyzed for Be-10 and Al-26. This unique data set, combined with the He-3 data from another source, provides information not only constraining glacial histories but also furthering the understanding of *in situ* production rates. The production rates calculated for Be-10 and Al-26 are in agreement, although they have substantial uncertainties, with those found in an earlier study on samples exposed for the last approximately 11 Ky. This implies that the production rate during the last 10 Ky is representative of the average over the last approximately 1000 Ky. In contrast, the production rate obtained for He-3 is lower than previous estimates using 2 to 15 Ky exposures, which can be explained by diffusive He-3 loss, consistent with experimental evidence. However, the generally smooth variation of He-3 with Be-10 and Al-26 indicates that diffusive loss occurs systematically in these samples. While the application of *in situ* produced cosmogenic isotopes to examination of geomorphological processes shows a great deal of promise, it is important to ensure that samples under examination are closed systems which have undergone a single exposure period. This may be accomplished by comparing several cosmogenic isotopes in the same sample, since each isotope responds uniquely to complicating processes such as diffusive loss and memory of earlier exposure for He-3, atmospheric contamination for Be-10, and other possible production mechanisms for Al-26.

E-44859

Kazarina, G.Kh., Mukhina, V.V., **Some characteristics of the development of the antarctic diatom flora during the Cenozoic**, *Oceanology*, Feb. 1990 29(4), p.484-486, 11 refs.

The development of the diatom flora in the southern ocean during the Cretaceous and Paleogene was local in character and was stimulated by local upwelling. During the Neogene-Quaternary, its diatom flora was ubiquitous; it exhibited a gradually increasing endemism, which attained its final form in the late Miocene-early Pliocene. The establishment of the antarctic convergence and divergence in the Neogene resulted in differentiation of the antarctic flora into subantarctic and high-antarctic types. The fossil diatom flora records numerous changes in the positions of hydrologic fronts caused by climatic fluctuations. (Auth.)

E-44867

Graf, T., Kohl, C.P., Marti, K., Nishiizumi, K., **Cosmic-ray produced neon in antarctic rocks**, *Geophysical research letters*, Feb. 1991 18(2), p.203-206, 17 refs.

Three antarctic rocks and quartz separates thereof were studied for their records of cosmic-ray produced Ne-21. All three samples reveal an excess of Ne-21 and in two of them a cosmic-ray origin is documented by the spallation ratios Ne-22/Ne-21. He-3 is shown to be incompletely retained in quartz. Previous studies have shown the suitability of quartz as a monitor for cosmic-ray produced radionuclides Be-10 and Al-26, and therefore as a tracer for geological processes. Al-26/Be-10 ratios allow the calculation of minimum exposure ages and maximum erosion rates, and measured ratios Ne-21/Be-10 and Ne-21/Al-26 add significant information to exposure histories, especially in the case of a complex exposure. This information is necessary for an evaluation of erosion rates and to define geological processes, such as uplift and variations in the antarctic ice cover. (Auth.)

E-44876

Askin, R.A., Elliot, D.H., Stilwell, J.D., Zinsmeister, W.J., **Stratigraphy and paleontology of Campanian and Eocene sediments, Cockburn Island, Antarctic Peninsula**, *Journal of South American earth sciences*, 1991 4(1-2), p.99-117, Refs. p.115-117.

Approximately 150 m of fine-grained Campanian sediments and over 100 m of fine-to medium-grained Eocene sands underlie Pliocene basalts and conglomerates on Cockburn I. The Campanian beds are part of the "Unnamed strata" of the Marambio Group and contain invertebrate and palynomorph fossils that predate the adjacent Seymour I. López de Bertodano succession. Rich palynomorph floras suggest a middle Campanian age. Deposition was in low energy, shallow shelf environments. Invertebrate and palynomorph fossils, and lithology, all indicate correlation of the Eocene beds with the basal La Meseta Formation, members Telm 1 and lower Telm 2 of Seymour I. The age of these beds is probably late early Eocene. The basal La Meseta sands are marginal marine to shallow shelf sediments that fill a broad valley, probably incised during latest Paleocene-earliest Eocene as a result of tectonism and sea-level lowstands. (Auth.)

E-44886

Wang, B.X., Zhang, Y.Q., Yang, C.H., **Research on the mineral inclusions from basalts and andesites on Fildes Peninsula, King George Island, Antarctica**, *Antarctic research*, 1991 3(1), p.14-21, In Chinese with English summary. 10 refs.

This paper deals with the characteristics, homogenization temperature, volatile constituents and chemical compositions of the glass and daughter minerals of the melt inclusions in diopside and plagioclase from Tertiary volcanic rocks on Fildes Peninsula. The homogeniza-

tion temperature of melt inclusions in the diopside ranges from 1070 to 1170 C. Many melt inclusions in plagioclases have homogenization temperature of 1100 C. The composition of the gas bubbles from melt inclusions in diopsides and plagioclases is 45-93% CO₂, a few to 35% H₂S, 2-20% CH₄, 2-14% CO, and small amounts of N₂, H₂, O₂ and H₂O. These compositions vary regularly from early to late stages of volcanic eruption. The compositions of glass and daughter minerals in diopside have been analyzed showing kirschsteteinite as the main daughter mineral. (Auth.)

E-44887

Liu, G.N., **Chemical weathering in soils at Fildes Peninsula of King George Island, Antarctica, Antarctic research**, 1991 3(1), p.22-29, In Chinese with English summary. 13 refs.

Chemical analysis shows remarkable chemical weathering effects in the soils of Fildes Peninsula. Compared with the bedrock, the elements of SiO₂, Al₂O₃, Fe₂O, FeO₃, MgO, CaO and Na₂O have been eluviated, and K₂O, H₂O+, H₂O-, TiO₂ and P₂O₅, enriched. The average ratio of SiO₂/Al₂O₃ is 4.71, which shows a weak chemical weathering property of the soils, and the ratio of SiO₂/Al₂O₃ suggests that the longer the weathering processes, the deeper the weathering level in the soils. The chemical weathering processes on Fildes Peninsula are greater than those on the continent. The eluviating rate of Al₂O₃ is greater than SiO₂, so that the SiO₂/Al₂O₃ increases from base to top in a soil profile in Antarctica. The chemical proportions in soils are greatly dependent on the bedrock in which they develop. The strong cryo-disturbances destroy the horizons of the soil. The high content of H₂O+ and H₂O- shows significant hydration in antarctic soils. (Auth.)

E-44895

Porebski, S.J., Meischner, D., Görlich, K., **Quaternary mud turbidites from the South Shetland Trench (West Antarctica): recognition and implications for turbidite facies modelling**, *Sedimentology*, Aug. 1991 38(4), p.691-715, Refs. p.714-715.

A piston core from the basinal part (depth of 5188 m) of the South Shetland Trench yielded a terrigenous mud section 11 m long, which can be subdivided with great precision into turbidite and hemipelagite layers. Mud turbidites (mean bed thickness=44 cm) alternate regularly with, and are best distinguishable from, their hemipelagite host (mean bed thickness=17 cm) by the following features: sharp basal contacts; terrigenous sand-free textures (except basal, well-sorted silt laminae) and the absence of outsized (ice-rafted) components; a laminated, little to non-bioturbated internal structure; distinct textural and compositional grading; and marked steps on water-content and sediment-density logs. It is concluded that 'contained' muddy turbidites cannot be adequately modelled using published sequences. Differentiation of single-model and 'contained' mud turbidites offers obvious advantages in basin analysis and in understanding the plethora of turbidity current-related depositional mechanisms of deep-sea mud. (Auth. mod.)

E-44898

Medina, F.A., Lirio, J.M., Marensi, S.A., Stinco, L.P., **Metaplacentieras (Ammonoidea) at Redondo Point, James Ross I., Antarctica, and its biostratigraphic implications** [*Metaplacentieras (Ammonoidea) en punta Redonda, Isla James Ross, Antártida, y su implicancia bioestratigráfica*], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.369, 8p., In Spanish with English, French and German summaries. 17 refs.

The *Metaplacentieras* genus has not been recognized until now as part of the antarctic Cretaceous. It is characterized by an involute shell and flat flanks, and a womb ornamented with falcoid ribs. An Upper Campanian age can be assigned to the outcropping sequence

of Redondo Point (southwest end of James Ross I.) as a consequence of the *Metaplacentieras* sp. and *Hoplitoplacentieras* sp. association. (Auth.)

E-44900

Del Valle, R.A., Nuñez, J.H., Rinaldi, C.A., **Deformation belt along the eastern border of the Antarctic Peninsula** [Faja de deformación a lo largo del borde oriental de la península Antártica], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1991 No.396, 32p., In Spanish with English and French summaries. Refs. p.23-27.

The overall region formed by the austral end of South America and the Antarctic Peninsula microplate is divided into 3 major blocks: southernmost South America, North of the Antarctic Peninsula, and South of the Antarctic Peninsula. A broad magmatic, sedimentologic and structural continuity between the two latter is assumed, since the local differences shown by the diverse Mesozoic-Tertiary events developed in the Antarctic Peninsula, considered as a whole, do not affect the sense of the structural connections between the two blocks and their close relations to that of South America. The belt of deformed Mesozoic beds existing to the east of the Antarctic Peninsula is assigned to compressional-type tectonics and is related to the tensions developed by various combined effects. The combination of the thrusts mainly generated by the subduction in the fore-arc region, and the roughly opposite thrusts produced by the arc separation from its original continental block (related to the dismemberment of Gondwanaland), could have originated the tensions which produced most of the Late Jurassic-Early Cretaceous deformational events exposed in this paper. (Auth. mod.)

E-44902

Findlay, R.H., **Silurian and Devonian events in the Tasman Orogenic Zone, New Zealand and Marie Byrd Land and their comparison with northern Victoria Land**, *Società Geologica Italiana. Memorie*, 1988 Vol.43, p.9-32, Refs. p.30-32.

The Tasman Orogenic Zone is a 300 km long, 800 km wide region forming the eastern third of Australia. Within this region major Cambrian to Triassic events led to the progressive eastward accretion and ultimately cratonization of the eastern margin of Australia. The Ordovician to Early Carboniferous geological history of the Tasman Orogenic Zone is reviewed and a close comparison is made between this region, New Zealand and Marie Byrd Land. Of note throughout this mobile belt is evidence of a major Devonian thermal event, which followed widespread Siluro-Devonian folding and which is recognized also in northern Victoria Land, which may also have formed part of the Tasman Orogenic Zone. Aspects of the Lower Palaeozoic sedimentary and structural history in northern Victoria Land are reviewed, and it is concluded that there is a strong likelihood that some of the structures there, currently attributed to the 500 Ma Ross Orogeny, are more likely to have formed during a Siluro-Devonian deformational event, the Borchgrevink Orogeny. (Auth.)

E-44904

Frenot, Y., Valleix, T., **Note and soil map of Amsterdam Island** [Notice de la carte des sols de l'île Amsterdam], *Comité national français des recherches antarctiques. CNFRA*, 1990 No.59, 49p. + map, In French. 13 refs.

The map (on a scale of 1:25,000) and the note presented provide detailed information on Amsterdam I., with a general review of the island's environment—such as its geology, topography, climate, flora and fauna—a description of 10 units of soil and their pedologic profiles, and an account of the method used.

E-44917

Asami, M., **Explanatory text of geological map of Balchenfjella, Sör Rondane Mountains, Antarctica**, Tokyo, National Institute of Polar Research, 1991, 14p. + 8 plates, 28 refs.

The text provides the location of the Sör Rondane Mountains, the location of Balchen Mountain within the range, and a brief history of their discovery and exploration. An outline of the rock structure and mineral content of the rock types is also provided. The accompanying geological map extends from 71 deg 50 min S through 72 deg 14 min S, between 26 deg 40 min E and 28 deg 00 min E, and is drawn at a 1:100,000 scale. It is designated as Sheet 31 of the NIPR Antarctic Geological Map Series and is captioned in both English and Japanese.

E-44920

Yoshida, M., Funaki, M., Vitanage, P.W., **Jurassic-Cretaceous dolerite dike from Sri Lanka**, *Geological Society of India. Journal*, Jan. 1989 Vol.33, p.71-75, 18 refs.

A dolerite dike from southwestern Sri Lanka gave whole-rock K-Ar ages of 152.6 Ma and 143.3 Ma. Many of the other dolerite dikes of Sri Lanka are considered to be of Mesozoic ages, judging from the present age data and tectonometamorphic history of Sri Lanka. A virtual geomagnetic pole position calculated from the mean NRM was rotated relative to Antarctica so as to fit with that obtained from the Jurassic Ferrar dolerite of Antarctica. This rotation results in the location and attitude of Sri Lanka to attach with Antarctica at Lützow-Holm Bay as suggested by Barron *et al.* (1978). (Auth mod.)

E-44921

Hayashi, M., Miura, K., **Some notes on several characteristic minerals sampled from East Antarctica**, *Shimane University. Faculty of Education. Memoirs (Shimane diagaku kyoikugakubu kiyo, shizen kagaku)*, July 1989 23(1), p.1-24, In Japanese with English summary. 18 refs.

Chemical analysis using EPMA has been carried out on several minerals sampled from East Antarctica, with special reference to secondary minerals. Results are summarized as follows: in the Balchenfjella region, eastern Sör Rondane Mountains, most of the secondary minerals are pure gypsum crystals, although they take various forms from place to place; in the northern part of the Balchenfjella region, the desert varnish is composed of crystalline jarosite mixed with amorphous silica, which is formed by solution of sulfuric acid ascending, by capillary action, through very narrow cracks within the inner fresh region of a gneiss rock. This solution of sulfuric acid is probably supplied by the underlying ground. Varved clay, sampled from the fluvio-glacial valley of the Mt. Riiser-Larsen area, has also been examined; it was found to contain large amounts of vivianite. Phosphatic acid which is necessary for the vivianite formation may safely be said to have been provided by bird droppings. (Auth. mod.)

E-44927

Santosh, M., Yoshida, M., **Fluid phase petrology of antarctic charnockites from the Lützow-Holm Bay: implications for carbonic metamorphism**, *Mineralogical journal*, Jan. 1991 15(5), p.175-189, 22 refs.

The occurrence of trapped fluid phases within upper amphibolite and granulite facies minerals in the gneiss-charnockite progression of the Lützow-Holm Bay (LHB) region, is reported. The abundance of carbonic inclusions shows as much as a 5 times increase when passing from gneiss to charnockite, suggesting the external influx of carbon dioxide which lowered the water activity through carbonic metamorphism. From the various phase-types of inclusions present in different minerals, and their relative chronology of entrapment, the fluid

evolution in the LHB is traced from an early high dense pure carbonic regime through mixed carbonic aqueous to a late aqueous regime. The scarcity of aqueous inclusions in the granulite minerals testifies to low P(H₂O) and high P(CO₂) conditions for the crystallization of the charnockite assemblage, which is in keeping with the solid phase equilibria observed in these rocks. Similar findings from granulite terrains in other Gondwana crustal segments suggest that CO₂ advection in the deep crust has been fundamental to the Earth's crustal evolution history. (Auth. mod.)

E-44930

Gersonde, R., **Taxonomy and morphostructure of Late Neogene diatoms from Maud Rise (Antarctic Ocean)**, *Polarforschung*, 1989(Pub. 1991) 59(3), p.141-171, With German summary. 38 refs.

Based on light microscopic (LM) and scanning electron microscopic (SEM) observations, late Neogene diatom taxa of the genera *Nitzschia*, *Rhizosolenia* and *Thalassiosira* that were recovered during RV *Polarstern* cruise ANT IV/4 with gravity and piston corers on the Maud Rise (SE Weddell Sea) are described and discussed. Five *Nitzschia* species (*N. arcuata*, *N. aurica*, *N. barronii*, *N. lacrima*, *N. praecurta*), two *Thalassiosira* species (*T. complicata*, *T. inura*), and *Rhizosolenia costata* are described new. Some of the treated taxa are useful stratigraphic markers. Their stratigraphic range in the southern high latitudes is described and their significance for paleoceanographic reconstructions is briefly discussed. (Auth.)

E-44931

De Wit, H., Van Enst, J.W.A., Laban, C., **Deception Island volcanism (South Shetland Islands, Antarctica): results from thin-section investigations**, *Polarforschung*, 1989(Pub. 1991) 59(3), p.173-178, With German summary. 8 refs.

Rock samples from Deception I. were studied macro- and microscopically. Based on the results of this study and in comparison with the literature it was possible to distinguish 3 different stages of magma evolution. 1) Early formation of plagioclase (An > 60%) and early mafics. 2) Formation of younger plagioclase (An 30-60%) as phenocrysts and rims around older plagioclase cores, both sometimes enclosing partly resorbed phase 1 mafics. Clinopyroxene rims surrounding older clinopyroxene cores. 3) Groundmass crystallization together with the breakup (leaching) of older plagioclase phenocrysts and subsequent overgrowth in an almost equal composition. Thin-section results confirmed the basic idea that the magma underwent fractional crystallization with subsequent increase in SiO₂ content and Fe/Mg depletion of the remaining magma. The final breakup of plagioclase phenocrysts and subsequent overgrowth in phase 3 was caused by leaching and is explained by late magmatic heat and volatile fluxes without the intrusion of new and more basic magma. (Auth.)

E-44932

Scasso, R.A., Grunenberg, T., Bausch, W.M., **Mineralogical and geochemical characterization of the Ameghino Formation mudstones (Upper Jurassic, Antarctic Peninsula) and its stratigraphical, diagenetical and paleoenvironmental meaning**, *Polarforschung*, 1989(Pub. 1991) 59(3), p.179-198, With German summary. 50 refs.

In studies of Ameghino Formation mudstones, epiclastic radiolaria-rich and mixed (radiolaria-rich + tuff) mudstone types are recognized. Contents of clastic material in the mudstones generally increase with younger paleontological age, but local exceptions to this trend have been found. The anoxic environment of the lower part of the sequence changes to more oxidizing conditions towards the top, in transition to the Hauterivian-Barrêmian conglomerates. Element-to-element correlations show good agreement with the normal differentiation trends of volcanic rocks, suggesting that the overall sequence is mainly volcanic in origin with various grade of reworking.

For example, the radiolaria-rich mudstone matrix could have originated from very fine tuffaceous suspensions deposited very slowly after the main fall of the tuffs. However, in the upper part of the sequence, some epiclastic supply is revealed by petrographic evidence and illite crystallinity index. The clay mineral association (illite, chlorite and illite-smectite mixed layers) is mainly of diagenetic origin in the stratigraphically lower sections. Low percentages of expendable layers in the illite-smectite mixed layers, as well as the general mineralogical association, suggest a late mesodiagenetic stage, and together with geological evidence, a relatively deep burial (>100 m-probably >2500 m) and temperatures exceeding 100 C. (Auth.)

E-44933

Richter, W., Haendel, D., **Discovery from Queen Maud Land, Schirmacher Oasis, Antarctica** [Eine Entdeckung aus dem Dronning-Maud-Land, Schirmacher-Oase, Antarktika], *Polarforschung*, 1989(Pub. 1991) 59(3), p.203-205, In German with English summary. 25 refs. For the article being commented on see 18E-41492.

Ingole & Parulekar (1990) published a paper on the limnology of Priyadarshani Lake in the Schirmacher Oasis as a result of two seasonal stays. A comparison with the existing literature concerning lake studies in the Schirmacher Oasis (East Antarctica) shows that isolated seasonal campaigns during short observation activities and small separate objects yield only an insufficient impression of the complex nature of antarctic fresh water lakes. The present paper discusses the inaccessibilities and faults of the publication. Some necessary additional remarks are given. A list of references shows that the literature on fresh water lakes in the region of the Schirmacher Oasis is more extensive than that used by the authors mentioned above. (Auth.)

E-44934

Sheraton, J.W., Thomson, J.W., Collerson, K.D., Kuehner, S.M., **Mafic dyke swarms of Antarctica**, *Geological Association of Canada. Special paper*, 1987 No.34, Mafic dyke swarms, edited by H.C. Halls and W.F. Fahrig, p.419-432, With French summary. Includes the addendum Mafic dykes of the East Antarctic Shield: a note on the Vestfold Hills and Mawson Coast occurrences by S.M. Kuehner, p.428-429. Refs. p.429-432.

DLC QE611.M22 1987

Early to Middle Proterozoic tholeiite dykes are widely distributed in the East Antarctic Precambrian Shield, but are largely confined to Archean cratonic blocks, including the Napier Complex of Enderby Land, the Vestfold Block of Princess Elizabeth Land, and the southern Prince Charles Mountains of Mac. Robertson Land. At least four major dyke suites, emplaced during three distinct episodes, about 2400, 1800 and 1400 to 1200 Ma ago, have been recognized. Most of the chemical and isotopic differences between dyke suites can be explained by derivation from compositionally distinct mantle source regions, which had been variably metasomatized by a volatile and LIL element-rich fluid phase. Phanerozoic mafic dykes are of more variable composition, and include calc-alkali and alkali basalts. Emplacement of several swarms of dolerite dykes in western Dronning Maud and Coats Lands was apparently related to the Early Paleozoic Ross, Middle Paleozoic Borchgrevink, and Late Paleozoic-Early Mesozoic Gondwanian orogenies of the Transantarctic Mountains. Locally abundant mafic dykes of West Antarctica and the Antarctic Peninsula and adjacent islands occur in association with voluminous Jurassic-Early Tertiary calc-alkaline plutonic and volcanic rocks which represent an active plate margin—the Andean magmatic arc. Basalt and dolerite dykes form a minor component of predominantly alkaline late Tertiary volcanism in the northern Antarctic Peninsula. (Auth.)

E-44937

Jull, A.J.T., Donahue, D.J., **Carbon-14 content of the antarctic meteorite, MacAlpine Hills 88105**, *Geochimica et cosmochimica acta*, Sep. 1991 55(9), p.2681-2682, 9 refs.

The authors have measured the content of the radioisotope C-14 in the lunar-composition meteorite MacAlpine Hills 88105. The level of C-14 in the sample was close to the blank, indicating a terrestrial age in excess of 37,000 years to 42,300 years, depending on whether the C-14 was produced by a 2π - or 4π -irradiation. (Auth.)

E-44938

Passchier, C.W., **Proterozoic geological evolution of the northern Vestfold Hills, Antarctica**, *Geological magazine*, July 1991 128(4), p.307-318, 38 refs.

The presence of polyphase shear zones transected by several suites of dolerite dykes in Archaean basement of the Vestfold Hills allows a detailed reconstruction of the local structural evolution. Archaean and early Proterozoic deformation at granulite facies conditions was followed by two phases of dolerite intrusion and mylonite generation in strike-slip zones at amphibolite facies conditions. A subsequent middle Proterozoic phase of brittle normal faulting led to the development of pseudotachylite predating intrusion of the major swarm of dolerite dykes around 1250 Ma. During the later stages and following this event, pseudotachylite veins were reactivated as ductile, mylonitic thrusts under prograde conditions, culminating in amphibolite facies metamorphism around 1000-1100 Ma. This is possibly part of a large-scale tectonic event during which the Vestfold block was overthrust from the south. In a final phase of strike-slip deformation, several pulses of pseudotachylite-generating brittle faulting alternated with ductile reactivation of pseudotachylite. (Auth.)

E-44939

Bradshaw, M.A., McCartan, L., **Palaeoecology and systematics of Early Devonian bivalves from the Horlick Formation, Ohio Range, Antarctica**, *Alcheringa*, 1991 15(1), p.1-42, Refs. p.40-42.

The distribution of bivalves and other fossils in the Horlick Formation is related to nine lithofacies. Most of the fauna comprises death assemblages. Thick external bryozoan growths on parts of certain bivalves and brachiopods suggest partial burial of shells during life. Other evidence indicates that some shells were exhumed and reburied. In terms of bottom communities, most of the fauna falls within Benthic Assemblages 1 and 2, and was close to shore, but the *Australospirifer* and crinoid-dominated fauna of lithofacies 8 at the top of the sequence indicates Benthic Assemblage 4 or 5, and lay further offshore. The fauna shows strong Malvinokaffric affinities and lesser connections with the Devonian of Reefton, New Zealand. Shallow water phosphate deposits that are anomalous for the latitudes proposed for the Ohio Range may be explained by either higher global temperatures during the Devonian, or by post-Devonian strike-slip movement of the region. The fauna is numerically dominated by brachiopods, but taxonomically, bivalves are more varied and form a strong component in assemblages. The bivalves include infaunal, epifaunal and semi-infaunal forms. A mode of life for each bivalve is suggested. Re-collection, and the restudy of existing material, has resulted in the establishment of two new genera and eight new species. (Auth. mod.)

E-44943

Prestvik, T., Duncan, R.A., **Geology and age of Peter I Öy, Antarctica**, *Polar research*, June 1991 9(1), p.89-98, 23 refs.

Peter I I. is located in the Bellingshausen Sea 400 km off the coast of West Antarctica. It is situated at the transition between oceanic and continental crust close to a former transform fault, the Tharp fracture zone. The island is completely volcanic, consisting of predominantly alkali basalt and hawaiite and some more evolved rocks. Sampling done by the *Aurora* expedition in 1987 has made dating and detailed petrological studies possible. The island appears to be much younger (<0.5 Ma) than previously believed. However, the volcanic activity responsible for this oceanic island may have lasted for 10-20 Ma, taking place simultaneously with the post-sub-

duction rift-related volcanism along the Antarctic Peninsula and in Marie Byrd Land. The petrologic data indicate that this may be coincidental and that the Peter I I. activity is independent and related to transtensional rifting along the Tharp fracture zone. (Auth.)

E-44969

Semenov, V.S., Vapnik, E.A., **Conditions of metamorphism and fluid characteristics of the high-pressure complex of the Shackleton Range, Antarctica**, *International geology review*, Apr. 1991 33(4), p.385-396, 31 refs.

The Early Paleozoic metamorphic complex of the Shackleton mobile belt followed a clockwise P-T loop from the staurolite-chlorite-muscovite subfacies of the epidote amphibolite facies $T=490-540$ deg, $P=4.5-5.0$ kbar to a high-pressure garnet-biotite-orthoclase subfacies of the almandine amphibolite facies $T=700-740$ deg, $P=8.0-11.0$ kbar on the prograde branch, and then a sharp drop in pressure in the retrograde branch stage under conditions close to isothermal ($T>650$ deg). $P=6.8$ kbar at $T=750$ deg is the maximum pressure obtained in fluid-inclusion thermobarometry. Cryometric measurements of the CH_4/CO_2 ratios in fluid inclusions occupy a region within the log fO_2 field where a carbon dioxide-methane fluid existed, which is consistent with the calculations of log fO_2 based on mass-spectrometric and gas-chromatographic analyses. (Auth.)

E-44970

Strait, M.M., **Solutions to problems of weathering in antarctic eucrites**, NASA/ASEE Summer Faculty Fellowship Program, 1990, Vol.2, edited by R.B. Bannerot, University of Houston, 1990, p.24-1 - 24-13, N91-27113 (N91-27103 - N91-27117), 14 refs.

Neutron activation analysis was performed for major and trace elements on a suite of eucrites from both antarctic and non-antarctic sources. The chemistry was examined to see if there was an easy way to distinguish antarctic eucrites that had been disturbed in their trace elements systematics from those that had normal abundances relative to non-antarctic eucrites. No simple correlation was found, and identifying the disturbed meteorites still remains a problem. In addition, a set of mineral separates from eucrite was analyzed. The results showed no abnormalities in the chemistry and provide a possible way to use antarctic eucrites that were disturbed in modelling of the eucrite parent body. (Auth.)

E-44978

Antarctic Meteorite Working Group, **Antarctic meteorite newsletter**, Vol.14, No.2, Sep. 1991, Houston, TX, NASA Johnson Space Center, 1991, 24p.

This newsletter presents classifications of 249 meteorites from the 1987-1990 collections, including the first announcements of meteorites from the 1100 collected during the 1990-1991 ANSMET season. Descriptions are given for 34 meteorites of special petrologic type, three of which are considered to be particularly noteworthy. In addition, LEW88280 and MAC88177 have been reclassified as lodranites. Descriptions of these meteorites are given in newsletters Vol.13, No.2 and 3.

E-44982

Benton, M.J., **Polar dinosaurs and ancient climates**, *Trends in ecology and evolution*, Jan. 1991 6(1), p.28-30, 25 refs.

Dinosaur skeletons have recently been found well within the contemporary Arctic and Antarctic Circles. These discoveries have surprised paleontologists who regarded the dinosaurs as warm-adapted animals. New geological evidence suggests that these polar areas were also rather colder than had been thought, and this raises further problems in interpreting dinosaurian palaeobiology. The discussion centers on whether the dinosaurs were fully endothermic, and able to survive the darkness and cold of the polar regions, or whether they could undertake vast annual migrations of 3000-4000 km.

E-45002

Raymond, C.A., LaBrecque, J.L., Kristoffersen, Y., **Islas Orcadas Rise and Meteor Rise: the tectonic and depositional history of two aseismic plateaus from sites 702, 703, and 704**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.5-22, 18 refs.

DLC QE39.T49b Vol.114 1987

Data from recent geophysical surveys of the conjugate Islas Orcadas and Meteor rises in the South Atlantic are discussed in relation to results of ODP Leg 114 drilling of these features. The morphology and the nature of basement on the two rises are examined. Seismic horizons are correlated with the drilled stratigraphy to establish a depositional history for each rise. Basement on Islas Orcadas Rise is generally smoother than on Meteor Rise, and there is evidence for a younger phase of volcanism on Meteor Rise. Meteor Rise has experienced a more dynamic depositional history, whereas flat-lying sediments on Islas Orcadas Rise are disrupted by Neogene faulting. Paleodepth estimates indicate that significant topography existed during the Paleocene-early Eocene, that the plateau portions of the rises formed below sea level, and that only the seamounts on the Meteor Rise appear to have formed on-ridge. It is speculated that the rises formed in the Late Cretaceous-early Tertiary, and that a second phase of volcanism occurred on Meteor Rise, contemporaneously with the initiation of seafloor spreading that separated the rises at 59 Ma. (Auth.)

E-45003

Kristoffersen, Y., LaBrecque, J., **On the tectonic history and origin of the Northeast Georgia Rise**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.23-38, 31 refs.

DLC QE39.T49b Vol.114 1987

Basalt overlying a weathered regolith was recovered at Site 698 and a basaltic substratum at the other sites is inferred from the down-hole variation in pore-water chemistry. The provenance of a 2-m thick gravel bed containing abundant clasts of continental lithologies displaced into lower Oligocene ooze at Site 699 is an enigma. The age of basement at Site 700, estimated by applying the observed Late Cretaceous sedimentation rate to the unrecovered sediments below the total drilling depth, indicates an age comparable to the estimated age of the crust in the adjacent ocean basin. From this the authors infer that at least part of the Northeast Georgia Rise was formed at a spreading center by excessive volcanism. At Site 698, later off-axis volcanism contributed to the construction of a western ridge that extended above sea level in pre-Campanian time. At least two episodes of deformation have subsequently modified the topography of the rise. Normal faulting that dissected much of the Northeast Georgia Rise by late Oligocene time is in part coeval with the opening of the Scotia Sea. During the Neogene, the western part of Northeast Georgia Rise experienced uplift of the order of 0.5-1 km, increasing toward South Georgia. Interaction with the advancing South Sandwich Trench and/or the South Georgia block may have induced an extensional regime with movement along low-angle normal faults to form much of the present topography of the southwestern part of the rise. (Auth.)

E-45008

Crux, J.A., **Calcareous nannofossils recovered by Leg 114 in the subantarctic South Atlantic Ocean**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.155-177, 61 refs.

DLC QE39.T49b Vol.114 1987

Cretaceous sections were recovered from Sites 698 and 700, located on the Northeast Georgia Rise and its lower flanks, respectively. These contain distinctive high-latitude nannofossil floras similar to those from high-latitude areas of the Northern Hemisphere. Most of the biostratigraphic datums used to date the upper Campanian to Maestrichtian interval appear to lie at approximately the same level in both hemispheres. Fossiliferous Paleocene to lowermost Miocene sediments were recovered at all seven sites, from the Northeast Georgia Rise in the west to the Meteor Rise in the east. These nannofossil floras, although restricted in diversity and only poorly preserved, are sufficiently distinctive to allow the recognition of 19 zones and three subzones, which are used to date and correlate the cores recovered. Only Site 704 on the Meteor Rise yielded a substantial section of Miocene to Quaternary nannofossil-rich sediments. The nannofossil floras of this section are of very low diversity, with usually fewer than eight species present. The diversities of the nannofossil floras and the presence of the warm-water genera *Discoaster*, *Sphenolithus*, *Helicosphaera*, and *Amaurolithus* reflect the changing surface water temperatures throughout the Cenozoic. Warmer periods are inferred for the late Paleocene to early middle Eocene, late middle Eocene to late Eocene, latest Oligocene to earliest Miocene, and possibly the Pliocene. Colder periods are inferred for the middle Eocene, most of the Oligocene, and the Miocene. Dramatic changes in the nannofossil floras of the Pleistocene of Site 704 are thought to reflect a rapidly changing environment. (Auth. mod.)

E-45009

Madile, M., Monechi, S., **Late Eocene to Early Oligocene calcareous nannofossil assemblages from Sites 699 and 703, subantarctic South Atlantic Ocean**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.179-192, 53 refs.

DLC QE39.T49b Vol.114 1987

Calcareous nannofossil assemblages were studied from Sites 699 and 703, drilled during ODP Leg 114 to the west and east, respectively, of the Mid-Atlantic Ridge in the subantarctic South Atlantic Ocean. Recovery at the two sites consists of an almost continuous sequence of upper Eocene-lower Oligocene sediments. This study describes the calcareous nannofossil assemblages at the transition between the Eocene and Oligocene and correlates these assemblages with those described in lower latitude sections. Quantitative analyses were performed on several important taxa in order to improve the biostratigraphic resolution and permit some paleoenvironmental interpretations. Several discrepancies were noted between the two sites and between the Eocene and Oligocene assemblages. The Eocene assemblages show a great number of species and warmer water conditions; the early Oligocene assemblages are less diversified and are indicative of cooler conditions. The Eocene/Oligocene boundary was not defined by planktonic foraminifers because of the strong dissolution, poor recovery, and drilling disturbances. On the other hand, the calcareous nannofossils assemblage allowed recognition of the interval where the Eocene/Oligocene boundary can possibly be placed. (Auth.)

E-45010

Gard, G., Crux, J.A., **Preliminary results from Hole 704A: Arctic-antarctic correlation through nannofossil biochronology**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.193-200, 27 refs.

DLC QE39.T49b Vol.114 1987

The abundance of calcareous nannofossils fluctuates strongly in the upper Quaternary interval of ODP Hole 704A in the southern South Atlantic. These fluctuations are tentatively correlated to the oxygen isotope stratigraphy, which shows that intervals rich in nan-

nofossils represent interglacial time periods. The nannofossil assemblages indicate that during about the last 650,000 yr, the surface waters at Site 704 were warmer than at present only in oxygen isotope stage 5, with probable restriction to substage 5e. The environment was interglacial also during oxygen isotope stages 7, 11, and 13, whereas stage 3 was characterized by intermediate glacial conditions. The nannofossil assemblages suggest that a significantly colder environment than at present prevailed in isotope stages 2, 4, 6, 8, 10, and 12. The fluctuations in nannofossil abundance in Hole 704A are correlated to nannofossil abundance patterns in the Norwegian Sea. During the last 500,000 yr, total abundances of nannofossils fluctuate in similar patterns in both the subantarctic and subarctic areas studied. Nannofossils were rare in the subarctic area between about 500,000 yr to over 1 m.y. ago, but were deposited in abundance around 650,000 yr ago in the subantarctic area. (Auth.)

E-45011

Brunner, C.A., **Latest Miocene to Quaternary biostratigraphy and paleoceanography, Site 704, subantarctic South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.201-215, 28 refs.

DLC QE39.T49b Vol.114 1987

The planktonic foraminiferal zonation of 1986, which was defined for the southwestern sector of the temperate South Pacific Ocean, was successfully extended to the temperate sequences at Site 704. The zonation is based on first and last appearances of globorotalids, principally *Globocanella* species, which are indigenous to temperate surface-water masses. Most of the first and last appearances at ODP Site 704 are diachronous with those in the warmer temperate to subtropical South Atlantic, North Atlantic, and South Pacific oceans. The upper Miocene, upper Pliocene, and Quaternary sequences are punctuated by frequent incursions of subantarctic and polar assemblages of planktonic foraminifers. It is assumed that the appearance of an assemblage dominated by sinistral *Neogloboquadrina pachyderma* means that the Polar Front has migrated northward, but to an unknown position. The upper Miocene sequence contains five incursions between 6.5 and 5 Ma and the upper Pliocene and Quaternary sequence contains 16 events since 2.47 Ma. These are minimum estimates because the number of observed events will probably increase with higher sample density and use of quantitative methods to reveal more subtle events. (Auth. mod.)

E-45012

Pujol, C., Bourrouilh, R., **Late Miocene to Holocene planktonic foraminifers from the subantarctic South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.217-232, 16 refs.

DLC QE39.T49b Vol.114 1987

Calcareous planktonic microfauna are of low diversity and are very rare or absent at sites located below the carbonate compensation depth (CCD). Sediments recovered from Sites 703 and 704 on the Meteor Rise at about 47S are useful for biostratigraphic and environmental studies. In the whole sequence 16 species or varieties of planktonic foraminifers were recognized. Two species occur in the uppermost Miocene. In the Pliocene the *Globorotalia puncticulata* population can be used to separate the early from the late Pliocene. The Pliocene/Quaternary boundary does not appear to be well distinguished in the foraminiferal assemblage. A faunal change noted at 2.5 Ma could correspond to the development of glaciation in the Northern Hemisphere and its antarctic counterpart. At about 5.2 Ma the first increase in polar fauna near the Meteor Rise occurs. Two other cooling periods are indicated in these sequences at about 4 and 3 Ma. Moreover, the hydrologic environment became more productive at about 2.1 Ma and close to the Brunhes/Matuyama Boundary. (Auth.)

E-45013

Nocchi, M., Amici, E., Silva, I.P., **Planktonic foraminiferal biostratigraphy and paleoenvironmental interpretation of Paleogene faunas from the subantarctic transect, Leg 114**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.233-279, 103 refs.

DLC QE39.T49b Vol.114 1987

Paleogene planktonic foraminifers recovered during ODP Leg 114 in the subantarctic region exhibit a cosmopolitan character at the opening of the Paleocene, and then they evolve similarly to faunas from lower latitudes. They begin to differentiate from lower latitude faunas by the early late Paleocene when large morozovellids disappear from the region and cool deep-water-dwelling *Globorotaloides* appear much earlier than at lower latitudes. By early Eocene time large morozovellids immigrate into the subantarctic area during the warmest episode of the entire Eocene. A new warming episode during the late Eocene is marked by the immigration of *Globigerinatheka luterbacheri* into the subantarctic region. The cooling trend during the late Eocene causes a progressive decrease in species richness, which only sporadically is less than 10 species. The early Oligocene is also characterized by relatively rich planktonic faunas, but after that time the western subantarctic region is occasionally invaded by few planktonic foraminiferal species. These immigrations coincide with the warmer episodes on the climatic curve, such as Zones P21a and P22-“N4.” Beginning in late early Eocene and through the Oligocene, eastern subantarctic planktonic foraminiferal faunas exhibit a much warmer character than those from the western side and are more similar to warm temperate faunas. Therefore, the eastern faunas provide a more refined biostratigraphy. Oligocene time is characterized by a trend toward a warmer climate; however, this trend was reversed in the early Miocene. (Auth. mod.)

E-45014

Huber, B.T., **Planktonic foraminifer biostratigraphy of Campanian-Maestrichtian sediments from Sites 698 and 700, southern South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.281-297, 42 refs.

DLC QE39.T49b Vol.114 1987

Site 698 penetrated 72.5 m of Campanian-Maestrichtian chalk and limestone with only 18.2% recovery, whereas Site 700 recovered 66.8% of a 152.7 m section of Coniacian-Maestrichtian limestone. Preservation of planktonic foraminifers from both sites is moderate in Maestrichtian samples, but worsens with increasing depth in the Campanian. The Northeast Georgia Rise planktonic foraminifers are typical of Late Cretaceous Austral Province faunas described from other southern high-latitude sites; species diversity is low and the assemblages are dominated by species of *Heterohelix*, *Globigerinelloides*, *Hedbergella*, and *Archaeoglobigerina*. Five species are considered to be endemic to the Austral Province. Formation of a cool temperate water mass in the circum-antarctic region, resulting from the final breakup of the Gondwana continents, may have led to increased provincialism of the Austral Province planktonic foraminifers during Campanian-Maestrichtian time. Magnetobiostratigraphic correlation of eight planktonic foraminifer datum events at Hole 700B with ages determined for datums at ODP Leg 113 Holes 689B and 690C (Maud Rise, 65S) demonstrates regional synchronicity of first and last occurrences within the Austral Province. As was observed at the Maud Rise, several keeled and nonkeeled species previously thought to have been restricted to warmer low-latitude regions first occur later at the Northeast Georgia Rise than at the low-latitude sites. The causes for high-latitude diachroneity among these immigrant species are not clear. (Auth. mod.)

E-45015

Silva, I.P., **Oldest Cretaceous planktonic foraminifers from Hole 700B**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.299-302, 4 refs.

DLC QE39.T49b Vol.114 1987

The oldest Cretaceous sediments in the subantarctic region were recovered from ODP Hole 700B in the East Georgia Basin. Planktonic foraminifers from the deepest indurated limestones could be attributed to the *Marginotruncana schneegansi* Zone of late Turonian age. (Auth.)

E-45016

Fenner, J., **Rare and unknown noncalcareous microfossils recovered from Leg 114 sites**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.303-310, 16 refs.

DLC QE39.T49b Vol.114 1987

The genus *Calicipedinium* of the family Actiniscaceae is reported from sediments as old as early Paleocene from sites drilled during ODP Leg 114 in the South Atlantic between 46.8 and 52S. Two new species, *Spongebria rudolphi* sp. nov. and *Calicipedinium georgiaensis* sp. nov., and one new combination, *Actiniscus elongatus* var. *pustulatus* var. nov., are described. (Auth.)

E-45017

Ling, H.Y., **Tripylean radiolarians from the subantarctic Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.311-315, 27 refs.

DLC QE39.T49b Vol.114 1987

The occurrence of tripylean radiolarians is reported for the first time from subsurface sediments of the subantarctic Atlantic Ocean. Although their occurrence is rare as well as sporadic, seven species belonging to four genera are recognized from Upper Cenozoic sediments drilled at Sites 699, 700, and 701 of ODP Leg 114 in 1987. (Auth.)

E-45018

Ling, H.Y., **Cretaceous (Maestrichtian) radiolarians: Leg 114**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.317-324, 30 refs.

DLC QE39.T49b Vol.114 1987

Cretaceous radiolarians were recovered from subantarctic Atlantic calcareous submarine deposits from two of the seven sites drilled during ODP Leg 114 in 1987. Fairly well-preserved radiolarian assemblages were found in Hole 698A samples from the Northeast Georgia Rise, whereas assemblages with fair to good preservation were observed from Hole 700B in the East Georgia Basin. The assemblage compositions from both sites are rather low in diversity and are characterized by the dominance of *Protoamphipyndax*, *Dictyomitra*, and *Stichomitra* species, but lack zonal markers recognized from the midlatitude to low-latitude region. Assignment of a Maestrichtian age is based on co-occurring calcareous microfossils. This report constitutes the second such occurrence from the Atlantic sector of the Antarctic Ocean subsequent to the analysis of ODP Leg 113 materials from the Weddell Sea. (Auth.)

E-45019

Spiegler, D., **Occurrence of *Bolboforma* (algae, chrysophyta) in the subantarctic (Atlantic) Paleogene**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.325-334, 22 refs.

DLC QE39.T49b Vol.114 1987

Sediments from ODP Holes 699A, 700B, 702B, 703A, and 704B were studied in order to determine and understand the distribution of *Bolboforma*. Ten *Bolboforma* taxa were detected in the 294 samples analyzed. Based on *Bolboforma* species, a zonation correlated to the paleomagnetic record is proposed for the late middle Eocene to early Oligocene. Four biozones can be defined: the *Bolboforma indistincta* Zone for the lower part of the upper middle Eocene sequence, the *Bolboforma eocena* Zone for the upper part of the upper middle Eocene to upper Eocene, the *Bolboforma geomaris* Zone for the upper Eocene, and the *Bolboforma latdorfensis* Zone for the lower Oligocene sequence. (Auth.)

E-45024

Hodell, D.A., Ciesielski, P.F., **Stable isotope and carbonate stratigraphy of the Late Pliocene and Pleistocene of Hole 704A: eastern subantarctic South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.409-435, 30 refs.

DLC QE39.T49b Vol.114 1987

Studies on ODP Hole 704A show that several important changes occurred in proxy paleoceanographic indicators across the Gauss/Matuyama boundary at 2.47 Ma. These are: accumulation rates of biogenic sedimentary components increased by an order of magnitude; planktonic $\delta^{18}\text{O}$ values increased by an average of 0.5 per mill; the amplitude of the benthic $\delta^{18}\text{O}$ signal increased; the accumulation rate of ice-rafted detritus increased several fold; and carbon isotopic ratios of benthic foraminifers decreased by 0.5 per mill, as did the $\delta^{13}\text{C}$ of the fine-fraction carbonate by 1.5 per mill, but no change occurred in planktonic foraminiferal $\delta^{13}\text{C}$ values. Most of these changes are consistent with more frequent expansions and contractions of the PFZ over Site 704 after 2.47 Ma, bringing cold nutrient-rich waters to 47S that stimulated both carbonate and siliceous productivity. The synchronous increase in $\delta^{18}\text{O}$ values and ice-rafted detritus accumulation in Hole 704A indicates that the 2.4 Ma paleoceanographic event included ice volume growth on both Antarctica and Northern Hemisphere continents. The decrease in benthic $\delta^{13}\text{C}$ values indicates that the ventilation rate of southern ocean deep water decreased and the nutrient content increased during glacial events after 2.5 Ma. At the Gauss/Matuyama boundary, benthic $\delta^{13}\text{C}$ values of the southern ocean shifted toward those of the Pacific end member, indicating a decrease in the relative mixing ratio of Northern Component Water and Circumpolar Deep Water. From about 2.3 Ma to about 1.4 Ma, the polar front zone was in a state of flux, occupying positions northward, over, and southward of Hole 704A. The effects of these motions on the stratigraphy of Hole 704A are discussed. (Auth. mod.)

E-45025

Mead, G.A., Hodell, D.A., Müller, D.W., **Fine-fraction carbonate oxygen and carbon isotope results from Site 704: implications for movement of the polar front during the Late Pliocene**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.437-458, 34 refs.

DLC QE39.T49b Vol.114 1987

Stable oxygen and carbon isotopes of fine-fraction (<63 microns) carbonate were analyzed to supplement similar analyses of benthic

and planktonic foraminifers. The fine fraction is generally composed primarily of coccoliths, and isotopic analyses of the fine fraction were made to complement the foraminiferal analyses. The isotopic curves thus generated suggest paleoceanographic changes not recognizable by the use of benthic and planktonic foraminifers alone. The global Chron 6 carbon isotope shift, found at 253-244 mbsf (6.39-6.0 Ma) at Site 704 in the planktonic and benthic record, is seen in the fine-fraction $\delta^{13}\text{C}$ record as a gradual decrease from 255 mbsf (6144 Ma) to 210 mbsf (4.24 Ma). At 170 mbsf, mean $\delta^{18}\text{O}$ values of *Neogloboquadrina pachyderma* increase by 0.6-0.7 per mill, reflecting decreased temperature and increased continental ice volume. Accumulation rates increase by 3.3 times above this depth. Carbon isotopic values of fine-fraction carbonate decrease by about 1.5 per mill at 2.6 Ma; however, no change is recorded in the $\delta^{13}\text{C}$ of *N. pachyderma*. The fine-fraction $\delta^{13}\text{C}$ shift slightly precedes an average 1 per mill decrease in $\delta^{13}\text{C}$ in benthic foraminifers. The cause of the benthic $\delta^{13}\text{C}$ shift is probably not directly related to the fine-fraction shift. The fine-fraction shift is most likely caused by a change in the upwelling to productivity ratio at this site and a change in the particle composition of the fine fraction. (Auth. mod.)

E-45027

Hodell, D.A., Müller, D.W., Ciesielski, P.A., Mead, G.A., **Synthesis of oxygen and carbon isotopic results from Site 704: implications for major climate-geochemical transitions during the Late Neogene**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.475-480, 14 refs.

DLC QE39.T49b Vol.114 1987

Composite oxygen and carbon isotopic records of planktonic and benthic foraminifers and fine-fraction (<63 microns) carbonate were used to identify major paleoceanographic events in subantarctic surface and deep waters during the past 10 Ma. The Late Neogene record of the subantarctic southern ocean is marked by progressive intensification of glacial-interglacial cycles, migrations of the polar front zone, and changes in deep-water circulation. The two most important times of rapid paleoceanographic change occurred during the Late Miocene (between 6.4 and 4.8 Ma) and Late Pliocene (especially at about 2.5 Ma).

E-45028

Katz, M.E., Miller, K.G., **Early Paleogene benthic foraminiferal assemblages and stable isotopes in the southern ocean**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.481-512, 55 refs.

DLC QE39.T49b Vol.114 1987

Previous studies document that a major benthic foraminiferal crisis occurred in the latest Paleocene in the Atlantic, Caribbean, and Pacific; a similar faunal turnover occurred in the latest Paleocene throughout the Atlantic sector of the southern ocean. At the Leg 114 sites, *Stensionina beccariiformis*-dominated assemblages were replaced by *Nuttallides truempyi*-dominated assemblages just prior to the Paleocene/Eocene boundary. A preponderance of benthic foraminiferal taxa last appeared immediately prior to the Paleocene/Eocene boundary, as recognized at these high latitudes by the last appearance of the calcareous nannofossil *Fasciculithus* ssp. and the first appearance of the planktonic foraminifer *Pseudohastigerina* spp. Recovery and biostratigraphic control at the Leg 114 sites are insufficient to constrain precisely the timing of the extinction event, although studies of material from the Maud Rise (Weddell Sea) suggest that it occurred in the latest Paleocene. Oxygen isotope evidence indicates that the southern ocean was filled with cooler water than that in the Pacific beginning at approximately 60 Ma, supporting the contention that the deep-water source was antarctic. However,

near the Paleocene/Eocene boundary (approximately 58-57 Ma), the supply of southern ocean "young" deep water was reduced or eliminated. The authors speculate that elimination of this inferred antarctic source between 58 and 57 Ma triggered the benthic foraminiferal turnover. (Auth. mod.)

E-45029

Froelich, P.N., **Biogenic opal and carbonate accumulation rates in the subantarctic South Atlantic: the Late Neogene of Meteor Rise Site 704**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.515-550, 30 refs.

DLC QE39.T49b Vol.114 1987

A preliminary composite depth section was generated for Site 704 by splicing Holes 704A and 704B together over the interval 0-350 mbsf (0-9 m.y.). High-resolution carbonate and opal data from the cores were correlated with the calcium and silicon signals from the GST logging run in Hole 704B to identify missing and disturbed intervals in the cores. Paleomagnetic and biostratigraphic age boundaries were then transferred to the composite depth records to obtain an age model, and sedimentation rates were calculated by linear interpolation between datums. Algorithms relating measured dry-bulk density to carbonate content and depth were generated to produce predicted values of density for every sample. Accumulation rates of bulk, carbonate, opal, and terrigenous sediment components were then computed to generate a record of sediment deposition on the Meteor Rise that has a resolution of better than 200,000 yr for the period from 8.6 to 1.0 m.y. This record of opal accumulation rates is interpreted as a long-term "Polar Front Indicator" that monitors the advance and retreat of the opal-rich PFZ northward (southward) toward (away from) the Meteor Rise in the subantarctic sector of the South Atlantic Ocean. The timing of PFZ migrations in the subantarctic South Atlantic Ocean is remarkably similar to Pliocene-Pleistocene climate records deduced from benthic oxygen isotope records in the North Atlantic ocean. (Auth. mod.)

E-45030

Nobes, D.C., Bloomer, S.F., Mienert, J., Westall, F., **Milankovitch cycles and nonlinear response in the Quaternary record in the Atlantic sector of the southern oceans**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.551-576, 37 refs.

DLC QE39.T49b Vol.114 1987

Previous studies of deep-sea sediment cores have found evidence for Milankovitch cycles, climatic cyclicity due to the periodicity of the Earth's orbital parameters. Many of the cores recovered on Leg 114 of the ODP showed outward signs of cyclicity, especially at Site 704. The GRAPE density, carbonate content, and magnetic susceptibility were analyzed using both standard and nonstandard spectral analysis techniques. One of the nonstandard techniques used was the Lomb-Scargle spectral estimation method, which is designed for unequally spaced data, and which yields as part of the process the statistical significance of any observed spectral peaks. Pairs of spectra were compared for statistical similarity using the Kolmogorov-Smirnov method. All of the data sets contain some spectral peaks, including both the expected Milankovitch cycles as well as other peaks. Upon further investigation, it was found that the other peaks could be explained as the nonlinear climate system response to the Milankovitch orbital forcing functions, because the extra peaks appear to be simple linear combinations, the Brunhes/Matuyama boundary (0.73 Ma B.P.) from strong long-period cyclicity in the Brunhes to more prevalent shorter period cyclicity in the Matuyama. (Auth.)

E-45031

Mwenifumbo, C.J., Blangy, J.P., **Short-term spectral analysis of downhole logging measurements from Site 704**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.577-585, 18 refs.

DLC QE39.T49b Vol.114 1987

Short-term spectral analysis was carried out on geochemical logging data from ODP Site 704. The FFT was used to compute the amplitude spectra of short-term overlapping segments to produce depth-period-amplitude spectrograms of the logging data. The spectrograms provided a means of evaluating the significance of the observed periodic components. The periodic components that were consistently present and prominent across a given record interval were considered to be significant. Changes in the spectrogram characteristics seem to reflect changes in either lithology, sedimentation rates, or hiatuses and may therefore provide useful information to aid in stratigraphic and paleoenvironmental studies. The dominant periodicity during the late Pleistocene and Brunhes Chron (0.97 to 0.47 Ma) was determined to be >100,000 yr, whereas the upper Matuyama Chron was dominated by the 41,000 yr periodicity. These periodicities suggest that the sedimentation patterns within the upper Matuyama Chron (0.98-1.78 Ma) were influenced by the Milankovitch obliquity cycle and those within the latest Matuyama-Brunhes Chron (<0.98 Ma) by the eccentricity cycle. The Brunhes/Matuyama boundary therefore represents a major discontinuity. Periodicities observed within the lower Matuyama and the upper Gauss Chron did not correlate with any of the periodicities within the Milankovitch frequency bands. (Auth.)

E-45032

Warnke, D.A., Allen, C.P., **Ice rafting, glacial-marine sediments, and siliceous oozes: South Atlantic/subantarctic Ocean**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.589-598, 75 refs.

DLC QE39.T49b Vol.114 1987

In the modern southern ocean, very little debris is delivered to the sea by icebergs. Whatever debris may be present beneath the ice sheets is lost near the grounding line. Whatever till is present beneath ice streams is also lost near the grounding line, but it may significantly contribute to fine-sized suspensoids. The bulk of the ice-rafted debris encountered at ODP Leg 114 drill sites was delivered in the geologic past, when antarctic glaciers had greater erosive power. Whatever ice-rafted detritus is present is essentially only an admixture to rapidly accumulating siliceous oozes. These oozes present a paradox because, in general, primary production in the open southern ocean is quite low. However, because the preservation of antarctic diatoms is far better than their preservation in low latitudes, high sedimentation rates result. These relationships are explained either in terms of high flux rates during the growth season, or as the result of a "stressed ecosystem," given to significant fluctuations, or as a combination of both mechanisms. These relationships lead to uncertainties in the computation of apparent mass-accumulation rates (AMARs) of ice-rafted detritus; nevertheless, a clear picture of the changes in antarctic glaciation emerges. The most significant results of these investigations of ice-rafted detritus are the recognition of (1) the antiquity (about 23.5 Ma) of (albeit insignificant) ice-rafting to these latitudes, and (2) a period of increased ice-rafting activity and northward expansion of the zone of major iceberg melting. (Auth. mod.)

E-45033

Allen, C.P., Warnke, D.A., **History of ice rafting at Leg 114 sites, subantarctic/South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.599-607, 20 refs.

DLC QE39.T49b Vol.114 1987

The first influx of ice-rafted debris at Site 699, on the northeastern slope of the Northeast Georgia Rise, occurred at a depth of 69.94 m below seafloor (mbsf) in sediments of early Miocene age (23.54 Ma). This material is of the same type as later ice-rafted debris, but represents only a small percentage of the coarse fraction. Significant ice-rafting episodes occurred during Chron 5. Minor amounts of ice-rafted debris first reached Site 701, on the western flank of the Mid-Atlantic Ridge (8.78 Ma at 200.92 mbsf), and more arrived in the late Miocene (5.88 Ma). The first significant quantity of sand and gravel appeared at a depth of 107.76 mbsf (4.42 Ma). Site 704, on the southern part of the Meteor Rise, received very little or no ice-rafted debris prior to 2.46 Ma. At this time, however, the greatest influx of ice-rafted debris occurred at this site. This time of maximum ice rafting correlates reasonably well with influxes of ice-rafted debris at Sites 701 (2.24 Ma) and 699 (2.38 Ma), in consideration of sample spacing at these two sites. These peaks of ice rafting may be Sirius till equivalents, if the proposed Pliocene age of Sirius tills can be confirmed. After about 1.67 Ma, the apparent mass-accumulation rate of the sediments at Site 704 declined, but with major fluctuations. This decline may be the result of a decrease in the rate of delivery of detritus from Antarctica due to reduced erosive power of the glaciers or a northward shift in the polar front zone, a change in the path taken by the icebergs, or any combination of these factors. (Auth.)

E-45035

Mwenifumbo, C.J., Blangy, J.P., **Stratigraphy, depositional environment, and diagenesis of sediments at Site 700 inferred from downhole measurements**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.649-656, 12 refs.

DLC QE39.T49b Vol.114 1987

Paleoenvironmental and diagenetic features within pelagic carbonate-rich sediments at ODP Site 700 are described based on logging data. The logging suite consisted of natural gamma-ray spectrometry (total count and percent K, U, and Th logs), induction (deep, medium, and focused resistivity logs), and induced gamma-ray spectrometry (Ca, Si, H, Cl, S, Fe, Al, and elemental yield ratio logs). The lithology encountered at this site shows progressive lithification with depth from soft oozes, nannofossil chalk, and indurated chalk finally to limestone. This progressive lithification is indicated on the induction and geochemical logs as a gradual decrease in conductivity and the porosity indicator ratio. The effects of diagenesis on the sediment column, other than compaction, are clearly indicated on the calcium elemental yield and induction resistivity logs. Increases in calcium yield (percent carbonate) correlate with a reduction in porosity, suggesting calcite cementation. Uranium enrichment within the carbonates at this site may be a product of either diagenesis or depositional environment. (Auth.)

E-45036

Nobes, D.C., Mienert, J., Dirksen, G.J., **Lithologic control of physical-property interrelationships**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.657-669, 22 refs.

DLC QE39.T49b Vol.114 1987

The lithology of sediment sequences has a significant effect on the interrelationships of physical properties. Conversely, physical-property interrelationships can be diagnostic of the lithology and lithologic variations of tectonic effects and of depositional hiatuses. The physical-property measurements obtained on Leg 114 of the ODP show correlations that are strongly dependent on the carbonate content, the biogenic silica (opal) content, and the presence of diagenetic cementation. The wet-bulk and grain densities in particular are indicative of silica vs. carbonate content: the greater the carbonate content, the greater the density becomes. The porosity and acoustic velocity are sensitive to diagenesis, and in the case of Leg 114 specifically illustrate the effects of carbonate diagenesis. As the carbonate content increases, the porosity decreases and the acoustic velocity increases; as the degree of diagenesis increases, the porosity decreases and the acoustic velocity increases. The acoustic velocity follows a smooth progression along a theoretical model curve from ooze to chalk to limestone. (Auth.)

E-45037

Mienert, J., Nobes, D.C., **Physical properties of sediments beneath polar front upwelling regions in the subantarctic South Atlantic (Hole 704A)**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.671-683, 17 refs.

DLC QE39.T49b Vol.114 1987

The physical properties of sediments beneath an upwelling area in the southern part of the Atlantic Ocean (ODP Hole 704A) were investigated. Highly significant correlations characterize the relationship of carbonate content to bulk density ($R=0.85$), carbonate content to porosity ($R=0.84$), and carbonate content to impedance ($R=0.84$). No relationship exists between carbonate content and compressional-wave velocity ($R=0.24$), indicating that amplitude variations in impedance are primarily controlled by variations in bulk density, which in turn are controlled by climatically driven biogenic opal and carbonate deposition. In general, maxima in impedance correspond to maxima in carbonate content (minima in opal content). The impedance record exhibits its most drastic change at about 2.4 Ma, marking dramatic increases in the average content of biogenic opal and the beginning of large-amplitude fluctuations. Between 0.7 and 0.4 Ma the carbonate content, bulk density, and grain density decrease while opal content drastically increases. Similar changes have been observed in sediments beneath an upwelling cell off northwest Africa, indicating an oceanwide enhancement in upwelling or in the calcite corrosiveness of bottom water that appears to be isochronous. (Auth.)

E-45038

Monty, C.L.V., Westall, F., Van der Gaast, S.J., **Diagenesis of siliceous particles in subantarctic sediments, Hole 699A: possible microbial mediation**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.685-710, 54 refs.

DLC QE39.T49b Vol.114 1987

A number of neogenic opaline structures, not previously reported in the literature, as well as other neogenic phases are described from four Oligocene to Pliocene biosiliceous sediment samples from Hole 699A. The possible influence of microbes on the formation or the morphology of some of them is discussed. The samples, which are early Pliocene, early to middle Miocene, and late Oligocene (two) in age, were histologically fixed aboard ship upon retrieval. Investigations of the samples used SEM (with Edax/Tracor) and XRD methods. The XRD data indicate possible cristobalite formation in the Miocene and uppermost Oligocene samples; the authors believe that the neoformed opaline structures (encrusted filaments and microhemispheroids) may represent an early phase of opal-CT. The timing of

neof ormation of most of these features appears to have been fairly recent, continuing even at the time of sampling. There appears to be no direct correlation of this incipient, lower Miocene-uppermost Oligocene diagenetic layer and the pore-water chemistry profiles; a large increase in shear strength in these sediments, however, may indicate some cementation. Smectite was identified by XRD as the most prominent clay mineral in these generally clay-poor sediments. Honeycombed minerals with filamentous edges, which could correspond to smectite, were observed with SEM in the pore spaces. (Auth. mod.)

E-45039

Nobes, D.C., Mwenifumbo, C.J., Mienert, J., Blangy, J.P., **Problem of porosity rebound in deep-sea sediment cores: a comparison of laboratory and *in-situ* physical-property measurements, Site 704, Meteor Rise**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.711-716, 14 refs.

DLC QE39.T49b Vol.114 1987

Previous comparisons of laboratory measurements and downhole geophysical logging have noted some discrepancies between the porosity derived from the neutron log and the porosity as determined from shipboard laboratory measurements. One proposed mechanism for the discrepancy has been called "porosity rebound": the cores undergo decompression upon recovery from the seafloor, and the porosity increases when the overburden pressure is removed. Laboratory and downhole geophysical measurements of the wet-bulk density and porosity are compared for carbonate-rich sediments from ODP Site 704, on the Meteor Rise. It is argued that the porosity calculated from the neutron log significantly underestimates the formation porosity for unconsolidated oozes, and it is concluded that if relatively undisturbed samples are selected then the laboratory measurements are representative of *in-situ* conditions, and no correction for porosity rebound is required. (Auth.)

E-45041

Hubberten, H.W., Morche, W., Westall, F., Fütterer, D.K., Keller, J., **Geochemical investigations of volcanic ash layers from southern Atlantic Legs 113 and 114**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.733-749, 27 refs.

DLC QE39.T49b Vol.114 1987

Petrographic and geochemical investigations were carried out on 21 ash layers from four sites of ODP Legs 113 and 114 in the southern Atlantic Ocean. With the help of geochemical data and petrographic characterization, three rock series can be distinguished for stratigraphically different ash layers from Site 701 (Leg 114) located east of the South Sandwich Island Arc, whereas the Leg 113 tephras from the southern slope of the South Orkney microcontinent belong to another magmatic series. Geochemical correlation of the Leg 113 tephras with possible source areas indicates that they were probably erupted from the Antarctic Peninsula. The Miocene ashes from Site 701 are probably derived from the now-extinct Discovery Arc, the precursor of the South Sandwich Is. The Pliocene ashes from the site show some affinity with the South Shetland Is., although the available data do not permit a clear correlation. The Quaternary ashes from site 701 display a chemistry typical of island-arc tholeiites, and are therefore most probably derived from eruptions on the South Sandwich Is. Because of their distant position the southern Andes seem to be rather improbable as a potential source region for the tephra layers investigated. (Auth.)

E-45042

Ciesielski, P.F., **Relative abundances and ranges of select diatoms and silicoflagellates from Sites 699 and 704, subantarctic South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.753-778, 18 refs.

DLC QE39.T49b Vol.114 1987

The stratigraphic ranges and relative abundances of selected diatoms and silicoflagellates are presented from three Neogene sedimentary sequences from the subantarctic South Atlantic. These data were compiled from Hole 699A in the southwest South Atlantic and Holes 704A and 704B in the southeast South Atlantic. Thirty-five samples were examined from a 67.5 m section of Hole 699A, which is mostly late Miocene or younger in age. 225 samples were examined from the upper 569.1 m lower Miocene to Quaternary section in Holes 704A and 704B. Although the partial census of the Site 704 sequences is only preliminary, it reveals that the Neogene is remarkably complete, and serves as a reference for further detailed examination of an important biostratigraphic and magnetostratigraphic reference section for the Neogene record of the southern ocean. (Auth.)

E-45056

Farabee, M.J., Taylor, E.L., Taylor, T.N., **Late Permian palynomorphs from the Buckley Formation, central Transantarctic Mountains, Antarctica, Review of palaeobotany and palynology**, Sep. 6, 1991 69(4), p.353-368, 32 refs.

Thirty species of dispersed plant microfossils were recovered from *Glossopteris*-bearing shales and coals of the Buckley Formation (Permian) on Mount Acherar in the central Transantarctic Mountains. Palynoassemblages of variable diversity, thermal maturity and preservation were also recovered from other Buckley outcrops at Mount Picciotto, Mount Sirius and Coalsack Bluff. Although Jurassic volcanic activity in the region thermally altered all palynomorphs, they could usually be sufficiently cleared with Schulze's Solution for photomicrography and identification. Recovered taxa, some of which suggest a Late Permian age (equivalent to Australian Stage 5) for the section, include: *Didactyletes ericianus*, *Lophotriletes novicus*, *Marsupipollenites triradiatus*, *Praecolpatites sinuosus*, *Retusotriletes nigrifellus*, *Protohaploxypinus amplius*, *P. limpidus*, *P. microcorpus*, *P. samoilovichii*, *Striatopodocarpites fusus*, *S. cancellatus* and *S. gondwanensis*. These taxa provide the first palynological evidence supporting correlation of this part of the Buckley Formation with previously published Late Permian assemblages from the Nilsen Plateau, Ohio Range and Prince Charles Mountains in Antarctica. (Auth.)

See also:

A-43124 A-43691 A-43833 A-43973 A-44763 B-43011
B-43179 B-43396 B-43494 B-43559 B-43937 B-44253 B-44254
B-44386 B-44388 B-44404 B-44458 B-44459 B-44484 B-44512
B-44539 B-44571 B-44848 B-44858 B-45006 B-45007 C-43380
C-44715 F-43061 F-43131 F-43254 F-43255 F-43302 F-43345
F-43428 F-43880 F-44357 F-44432 F-44771 F-44851 I-43228
I-44214 I-44416 I-44537 I-44842 J-43138 J-43139 J-43174
J-43743 J-43763 J-43773 J-43780 J-43881 J-43890 J-44088
J-44097 J-44098 J-44099 J-44106 J-44188 J-44193 J-44255
J-44256 J-44364 J-44377 J-44378 J-44387 J-44493 J-44495
J-44496 J-44497 J-44553 J-44560 J-44640 J-44853 J-45001
J-45005 J-45026 J-45040 K-43241 K-44766 L-42994 L-42997
L-43303 L-43662 L-43714 L-43721 L-43722 L-43785 L-43818
L-43878 L-43974 L-43975 L-44100 L-44104 L-44107 L-44109
L-44111 L-44174 L-44176 L-44187 L-44192 L-44196 L-44216
L-44240 L-44241 L-44245 L-44246 L-44384 L-44385 L-44719
L-45004 L-45020 L-45021 L-45022 L-45023 L-45055

F. ICE AND SNOW

F-42882

Sykes, P., **Antarctic iceberg size distribution: icebergs produced by the Wordie Ice Shelf, Scott Polar Research Institute. Sea Ice Group. Technical report, 1989** No.89-3, 18p. + figs., 19 refs.

The size distribution of 2330 out of 2510 icebergs calved from the Wordie Ice Shelf was determined from a satellite image taken on Feb. 24, 1988. Seventeen icebergs over 3 km long and 163 less than 300 square meters in area were not included. The 2330 icebergs ranged in length from 29.0 m to 2945.8 m with an average of 321 m and in width from 10.3 m to 1781.8 m with an average of 151 m.

F-42883

Crane, D.R., Bull, D., **Data report on the Weddell Ice Dynamics Experiment, Scott Polar Research Institute. Sea Ice Group. Technical report, 1990** No.90-2, n.p., 4 refs.

Eleven drifting buoys were launched in the Weddell Sea in Feb., Mar., and Oct. 1989, in an area from about 10W to 54W and 67S to 75S, to measure atmospheric pressure, air temperature, water temperature, wind speed, wind direction, current speed, current direction, ice temperature, and ice orientation. The current speed averaged between .02 and .03 of the wind speed over short intervals and .028 over the long term.

F-42890

Kamiyama, K., Fujii, Y., Watanabe, O., Yamada, T., **Electrical conductivity and pH in snow and ice samples from various glacier areas, Antarctic record, July 1990** 34(2), p.119-129, 8 refs.

Electrical conductivity (EC) and pH of melted snow and ice samples from Nepal, Patagonia, arctic regions and Antarctica are compared. Most samples showed regional differences in means and ranges of EC and pH values. Low concentrations of dissolved substances, however, were accompanied by low ECs and approximately constant pH values, independent of the regions. Higher values of EC brought about regional pH differences. The pH increased with higher EC values in coastal Antarctica (Showa Station), Nepal and Patagonia. In contrast, pH decreased with the increased EC in snow from inland Antarctica. The values of EC and pH in the Greenland samples are similar to those in the inland region of Antarctica. (Auth. mod.)

F-42891

Funaki, M., **Note on the natural remanent magnetizations of dirt-ice layers collected from the bare ice field in East Antarctica, Antarctic record, July 1990** 34(2), p.131-138, 16 refs.

Natural remanent magnetizations (NRMs) of 5 dirt-ice layers including tephra collected from the Allan Hills in Southern Victoria Land, the Yamato Mountains and the Sör Rondane Mountains were investigated. Magnetization was measured only in the dirt-ice layers recognized by the naked eye; magnetizations in the clear-ice were weak for any significant measurements. The uniform NRM directions were obtained in the dirt-ice layers with upward directions. Those of the oriented 2 samples (A, E) were almost parallel to the present geomagnetic field direction *in situ*. A possible mechanism is rearrangement of the magnetic grains adjusting the NRM directions

to the geomagnetic field direction due to partial melting of the ice around the grains by solar radiation. (Auth. mod.)

F-42892

Matsuda, O., Ishikawa, S., Kawaguchi, K., Nishizawa, H., **Variation of the vertical distribution of the sea ice temperature near Syowa Station, Antarctica from September 1984 to January 1985, Antarctic record, July 1990** 34(2), p.139-144, 10 refs.

Monthly observation of vertical distribution of sea ice temperature was carried out near Showa Station from Sep. 1984 to Jan. 1985. Ice thickness varied between 139 cm and 155 cm. Since the bottom ice temperature resembled the underlying seawater temperature, while the surface ice approached the air temperature, distribution of temperature generally showed a steep gradient across the ice. Ice temperature at the surface and the bottom varied from -15.2 to -0.3 C and from -2.0 to -0.3 C, decreasing with depth. The minimum ice temperature rose from Sep. to Jan. (Auth. mod.)

F-42897

Motoyama, H., Azuma, N., Decleir, H., Huybrechts, P., **Report of the glaciological field party in the Sör Rondane Mountains region, 1989-1990 summer season (JARE-31), Antarctic record, July 1990** 34(2), p.225-234, In Japanese with English summary. 1 ref.

The summer party of JARE-31 carried out maintenance of automatic meteorological stations, glaciological and weather observations, and drilling tests from late Dec. 1989 to Jan. 1990, in the Sör Rondane Mountains region. Three prototypes of electromechanical ice drills for deep core sampling, using antifreezing liquid, were successfully tested on Jennings Glacier, and the dynamics of glacier movement were studied. Mass balance measurements were conducted on glaciers of Brattnipane Peaks. (Auth. mod.)

F-42900

Nazirov, M., Pichugin, A.P., Spiridonov, I.U.G., **Radar sounding of the surface of the Earth from space [Radiolokatsiia poverkhnosti Zemli iz kosmosa], Leningrad, Gidrometeoizdat, 1990, 200p., In Russian. 237 refs.**

This book presents the results of scientific and engineering investigations concerned with the design and operation of side-looking radar (SLR) on board Soviet environmental satellites. Physical and technical characteristics of SLR and other satellite sensors have been compared, and algorithms of SLR calibration and digital data processing have been analyzed. Scientific and methodological problems in obtaining data from ocean surfaces, and sea and land ice cover, are discussed in detail. The final chapter is devoted to the characteristics of land ice: radioglaciological landscapes of Antarctica, eolian mesostructures of antarctic glacier surfaces, radar observations from space of the dynamics of ice shelves and the drift of icebergs in Antarctica, and an analysis of radar maps of ice cover in Greenland. (Auth. mod.)

F-42945

Ventajas, L., Genest, E., **Oil contamination of antarctic ice [La contaminación por petróleo en el hielo antártico], Buenos Aires. Instituto Antártico Argentino. Contribución, 1990** No.381, 23p., In Spanish with English, German and French summaries.

The effects and political and environmental implications of oil spills in antarctic waters are analyzed, considering the sea ice as a source of contamination, accumulation, and a probable vehicle for the diffusion of contaminants. The existing agreements and regulations of the Antarctic Treaty System—regarding pollution from oil spills and the effects on the sea ice—are examined. The permeation of sea ice by carcinogenic polynucleate hydrocarbons, or their equally harmful derivatives, and the far-reaching consequences to the marine environment and its ecosystems, are discussed. (Auth. mod.)

F-42968

Xie, Z., Li, J., Young, N.W., **Physical characteristics of the snow and ice cover of Law Dome, East Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.8-22, 32 refs.

An outline is presented of the main snow and ice cover characteristics from data obtained during oversnow traverses at Law Dome. The Dome's ice cap is about 200 km in diameter with a maximum surface elevation of 1390 m. There is strong east-west gradient in accumulation rate across the ice cap, from values in excess of 1000 kg sq m/a in the east to 0-250 kg sq m/a in the west. This variation in accumulation rate has a dominant influence on the distribution of physical properties and attributes of the ice cap. The distribution of ice formation zones is asymmetric: the elevation of boundaries between the zones is much lower on the east than on the west side. Surface velocity of the ice cap is much greater in the east than in the west. Mean annual surface temperature varies linearly with elevation over a narrow range from -9 to -21 C. The average densification rate in the firn layer varies linearly with accumulation rates on Law Dome. Measurements of crystal growth rate in firn suggest that, at temperatures warmer than -20 C, the activation energy parameter for this process is dependent on temperature. Analyses of deep ice cores show that the distribution within the ice cap of the properties of crystal size and c-axis orientation are primarily determined by the dynamics of the cap. (Auth. mod.)

F-42969

Qian, S., Liu, C., **Measurement of ice thickness on the Nelson Island ice sheet**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.28-32, 2 refs.

During the summer season of 1987-1988, radio-echo sounding measurements of the Nelson I. ice sheet showed two sections of 14.7 km in total length, consisting of 148 measuring points and showing a clear bedrock pattern. The pattern of Section "E" is different from that of Section "N" because of the different directions of ice movement. The maximum thickness of the Nelson I. ice sheet is 169 m at Point E86; the average ice thickness is about 120 m. (Auth. mod.)

F-42970

Gao, X., Jacka, T.H., Budd, W.F., **Development of ice crystal anisotropy in shear and comparisons of flow properties in shear and compression**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.32-40, 15 refs.

Simple shear and uniaxial compression experiments were performed on several laboratory prepared ice samples. Three crystal orientation fabrics obtained at 240 m depth from the ice core extracted from BHF, near the coast of Law Dome, are shown. At this depth, a peak of high shear zone was observed. Also shown are 3 crystal orientation fabric plots from the laboratory experiments. The fabric developed from the laboratory experiments is similar to that exhibited in the high shear zone in the ice core. Although the development of a particular crystal anisotropy may not be unique to a particular stress configuration, it seems likely that the laboratory and field fabrics

illustrated have been developed under similar stress configurations, i.e. simple shear to strains in excess of about 30%.

F-42971

Jacka, T.H., Gao, X., **Ice crystal orientation fabrics and related glaciological parameters from neighbouring antarctic core sites**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.41-52, 24 refs.

Crystal orientation fabrics and related data are presented from 2 ice cores drilled near the summit of Law Dome. Small circle girdle crystal orientation fabrics, indicative of an internal stress configuration consisting predominantly of compression, are exhibited by the core from site A001. The surface and bedrock elevation data suggest that A001 is a near stationary summit point on Law Dome. Although site BHD is only 1 km from site A001, the BHD crystal orientation fabrics exhibit single maximum patterns, suggesting an internal stress configuration dominated by simple shear. Site BHD is lower than A001, and apparently is sufficiently removed from the stationary point for strains in shear to have developed this fabric pattern. By analyzing annual layer thicknesses (obtained from oxygen isotope values) the vertical strain in the two ice cores is calculated. The importance of examining the development of ice crystal orientation fabrics with respect to the stress configuration and the total strain undergone is emphasized. (Auth. mod.)

F-42972

Han, J.K., Young, N.W., **Structural characteristics of snow firn at the surface part on Law Dome ice cap, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.53-63.

The visual and inner structural characteristics of snow firn above the firn-ice transition depth at the surface part of Law Dome ice cap has been investigated by the analysis of 4 cores collected from different ice formation zones. Results of measurements show that the snow firn density variation at each ice formation zone can be described as a quadric curve against depth, and the firn-ice transition depths increase as the zones change from wet to dry. Generally, the crystal size of snow firn increases with depth. The fabric feature, similar to that of a temperate glacier observed in the core from wet snow zones, suggests some homogeneity of the crystal deposition and recrystallization conditions. The influence of the seasonal temperature difference and the caused temperature gradient on the recrystallization of snow firn crystals is seen. Observation did not show any other structural difference of the crystals in the thicker ice layers from that of the firn besides their bigger size. (Auth. mod.)

F-42974

Zhang, Q., **Evolution of the antarctic ice sheet since Late Pleistocene**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.67-73, 43 refs.

Based on research carried out in the Vestfold Hills in 1981, a few correlated questions on the evolution of antarctic ice sheet, such as glacial advance and recession, climatic and sea level changes and glacial-isostatic rebound since the Late Pleistocene, are discussed. (Auth. mod.)

F-43050

Petrov, V.N., Barkov, N.I., Lipenkov, V.I.A., Ivanov, V.S., **Results of ice core investigations on the slope of the antarctic ice sheet** [Rezultaty izucheniia ledianogo kerna iz skvazhiny na sklone antarkticheskogo lednikovogo pokrova], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovaniĭ*, Nov. 1989 No.67, p.108-116, In Russian with English summary. 24 refs.

The results of structural studies of the ice core obtained from a 750 m deep borehole, drilled at a distance of 73 km from the Mirnyy Station, are discussed. The data obtained testify to the existence of an internal gliding plane within a glacier body, placed at a depth of 230 m. Analysis of the results of the total gas content in ice allowed an estimation of the altitudinal changes of the glacier surface in the Holocene. It was found that the thickness of the antarctic ice sheet in the area situated 200-300 km from the present-day coastal line at the beginning of the Holocene, evidently exceeded its present-day thickness by 400-500 m. (Auth. mod.)

F-43051

Barkov, N.I., Blinov, K.V., Petrov, V.N., Salamatina, A.N., **Numerical experiments on the reconstruction of the paleoclimate, based on results of the thermometry of a deep borehole at Vostok Station, Antarctica** [Chislennyye eksperimenty po rekonstruktsii paleoklimata na osnove rezul'tatov termometrii glubokoi skvazhiny na stantsii vostok v Antarktide], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovaniĭ*, Nov. 1989 No.67, p.116-121, In Russian with English summary. 12 refs.

Computerized experiments have led to the hypothesis that for the last several tens of thousands of years no significant variations of the accumulation rate in the central part of Antarctica have taken place. It was assumed that, on average during the Holocene, the thickness of the antarctic ice sheet in the area of Vostok Station was greater than at present and reached 3800 m. The discrepancy between the experimental and theoretical thermograms was found to be near 0.05 C. Optimum values of the parameters describing the theoretical thermogram were evaluated and possible fluctuations shown. Possible causes for the discrepancy as well as promising directions for further investigations are discussed. (Auth. mod.)

F-43061

Delisle, G., Sievers, J., Schultz, L., **Radio-echo sounding survey across the Allan Hills Icefield, Antarctic journal of the United States**, 1989 24(5), p.50-52, 4 refs.

A radio-echo sounding comprehensive study of the subice topography of the Allan Hills Icefield and the adjacent Near Western Icefield was carried out, with the primary objective being to understand the glaciology of the area and how it relates to the meteorite fields. Results indicate that (if current conditions persist) all the ice entering the Allan Hills Icefield today will be ablated, and all the meteorites it contains will eventually be exposed. It appears that more ice is currently ablated than is supplied, meaning that the Allan Hills Icefield is probably in a state of thermal decay at this time. During the course of these investigations, 198 meteorites were found.

F-43088

Yao, T.D., Petit, J.R., Lorius, C., **Microparticle concentration measurement and its climatic implications in an ice core from coast area, Antarctica, Science in China, Series B**, Sep. 1990 33(9), p.1102-1109, 12 refs.

The microparticle concentration in an ice core from the coast area, East Antarctica, has been measured by a Coulter counter and

optic counting. It is proposed that the microparticle concentrations in different areas are different, especially from the coast to the inland areas of Antarctica. After comparison with microparticle concentrations from other cores, it is also proposed that there is a lag between the coldest climate (i.e. 18 ka bp) and the highest microparticle concentration. (Auth.)

F-43096

Raymond, C.F., Weertman, B.R., **Initiation of strain measurements on Dyer Plateau, Antarctic Peninsula, Antarctic journal of the United States**, 1989 24(5), p.71.

To determine the present flow regime in this vicinity of the Dyer Plateau, an accumulation and strain net of 70 markers was deployed in 5 longitudinal and 7 transverse lines, providing coverage in a band roughly 5 km wide and 25 km long extending 15 km west of the divide and 10 km east of it. The spacing of markers was graded with a high density of 0.5 km spacing in an approximately 3 sq km centered on the divide. This local high-density array was surveyed by electromagnetic distance ranging and angle measurement by theodolite. The topography determined by the survey shows that the divide in this locale slopes gently northward and is underlain by rugged subglacial topography with ice depths varying from 300 m to more than 1,000 m.

F-43097

Bindshadler, R.A., Stephenson, S.N., Vornberger, P.L., Roberts, E.P., **Continued analysis of field data of the Siple Coast, West Antarctica, Antarctic journal of the United States**, 1989 24(5), p.72-73, 8 refs.

The goals of the Siple Coast Project are to determine the mass balance of that portion of the west antarctic ice sheet that drains into the Ross Ice Shelf; to identify the physical processes controlling its ice flow; and to predict its future using sophisticated numerical models. Twenty-two sites were visited in the catchment areas of Ice Streams D and E to provide data for calculating the present net mass balance. Analysis of the temperature profiles shows that Crary Ice Rise is much younger than Holocene age. Reoccupation of a marker on a raft at the side of the ice rise confirmed that the raft has separated from the ice rise. Analysis of other data collected in previous years from around the ice rise implies that the ice rise is migrating upstream. At the mouth of ice stream C, remeasurements of stake positions and strain figures confirm that the ice is almost stagnant with velocities of only a few meters per year. Analysis of a set of 10 thematic mapper images indicates a number of interesting features which include a distributed system of thin ice streams that feed into the main ice stream, the intermittent nature of streaming flow in the upper regions of ice streams, the narrowness of the crevassed margins of ice streams D and E (in contrast to the broad northern margin of ice stream B), and the ability to see ancient flow features on ice stream C even though this ice stream appears to have stopped some 200 years ago.

F-43098

Alley, R.B., **Ice-stream basal modeling: progress report, Antarctic journal of the United States**, 1989 24(5), p.74, 13 refs.

One of the main difficulties in predicting future behavior of the west antarctic ice sheet is lack of an accepted bed model for the fast-moving ice streams that drain it. In cooperation with the ongoing field studies of the Siple Coast Project, development of a model for ice-stream motion through deformation of subglacial till continues. ("Deforming bed" refers to the bedrock underneath the ice sheet.) This hypothesis grows out of the seismic observation of a water-saturated, unconsolidated layer with high water pressure and high porosity beneath ice stream B, West Antarctica, and the strong probability that pervasive deformation in this layer controls ice-stream motion. The seven basic points of the model are stated.

F-43114

Hodge, S.M., Jacobel, R.W., Wright, D.L., **Low-frequency ice radar studies on ice streams B and C, West Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.79-81, 6 refs.

A high-speed digital data acquisition system was developed for use with ice radars, and the low-frequency, short-pulse ice radar originally developed by the U.S. Geological Survey for temperate glaciers was adapted for surface-based investigations on ice sheets. This new ice-radar system was used on ice streams B and C, West Antarctica, to study internal layering and basal conditions, on the premise that this new range of frequencies, 1-32 megahertz, should provide additional information about these phenomena and about the dynamics of the ice streams. Besides ice thickness and motion measurements and bottom topography observations, unusual folds and undulations were discovered from returns of internal layers in ice stream B.

F-43115

Harrison, W.D., Echelmeyer, K.A., **Short-term variations in the speed of ice stream B, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.81-82, 4 refs.

A search for variations in the speed, vertical strain rate, and seismicity of ice stream B was begun in late Nov. 1988, near Upstream B camp (83.5S 138.2W). This is part of a cooperative program to study the dynamics of this and the other rapidly moving ice streams that feed the western side of the Ross Ice Shelf. The program consists of two parts: the measurement of ice speed and surface strain rate while personnel are in the field, and the measurement of strain rate and seismicity year round by geophones and strain wires installed in several shallow boreholes near Upstream B Camp and the California Institute of Technology drill site. At the end of the field season, the strain wires were still responding to transient effects associated with their installation, and there had been little seismicity; however, about 5 weeks of velocity data had been acquired by two methods, both of which determined distance to two reference points located on relatively stagnant ice off the ice stream. In the one case an ultra-high-frequency positioning system was used for daily motion studies; in the other, an EDM was used for terrestrial surveying, which was typically done several times per day, but sometimes hourly. The latter system is the more sensitive, although its success is weather dependent.

F-43116

Engelhardt, H., Fahnestock, M., Humphrey, N., Kamb, B., **Borehole drilling to the bed of ice stream B, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.83-84, 14 refs.

The great ice streams flowing through and out of the west antarctic ice sheet move at speeds of hundreds of meters per year, while the ice sheet itself moves only a few tens of meters per year. The authors' goal is to understand the basic physical mechanism that controls the rapid motion, both because it is an interesting glaciological phenomenon in its own right and because it may have important consequences for worldwide climatic change. The key to the rapid motion lies, it is thought, at or near the bottom of the ice. Three different mechanisms for rapid motion have been proposed: superplasticity of the basal ice; rapid basal sliding of the ice over its bed; and rapid deformation of a layer of subglacial till. Determining which of these (if any) is the actual mechanism requires gaining access to the basal zone and making appropriate measurements there. Details of a hot water drilling method are explained along with problems experienced. Comparisons are made with arctic drilling.

F-43130

Spindler, M., **Comparison of arctic and antarctic sea ice and the effects of different properties on sea ice biota**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.173-186, 47 refs.

DLC QE350.6.N38 1988

Both polar regions are covered by extensive seasonal sea ice which is inhabited by a variety of plants and animals. The number of organisms living in the sea ice may exceed those in the water column by several orders of magnitude per unit volume. However, between the two polar regions there are fundamental differences in sea ice properties such as mean age, thickness distribution, mean salinity, development, crystal structure, and minimum and maximum sea ice expansion. These differences not only influence the space available for settlement but also the abundance, diversity, and distributional pattern of species living in the sea ice system both in the Arctic and Antarctic. Key species from the sea ice community may be used as tools in reconstructing the extent of sea ice cover in the past. (Auth.)

F-43131

Pfirman, S., Lange, M.A., Wollenburg, I., Schlosser, P., **Sea ice characteristics and the role of sediment inclusions in deep-sea deposition: Arctic-antarctic comparisons**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.187-211, Refs. p.206-211.

DLC QE350.6.N38 1988

Much of arctic sea ice forms over the shallow continental shelves along the perimeter of the basin. Ice which escapes the shelf is transported several years within the Beaufort Gyre and Transpolar Drift stream, before exiting the Arctic Basin through Fram Strait. This ice, and especially that in the Siberian branch of the Transpolar Drift stream in the Eurasian Basin, may incorporate large quantities of particulate matter during formation on the shelf. Subsequent seasonal surface melting and winter freezing on the ice underside results in surface accumulation of particulate matter. Rafting of floes over and under each other results in a complex ice stratigraphy and redistribution of sediment accumulations. In contrast, antarctic sea ice has only limited sources for sediment incorporation, and most of the ice-cover melts each year. These variations in arctic and antarctic ice characteristics are illustrated by analyses of ice crystal texture, c-axis orientations, salinity, $\delta^{18}O$ on ice cores and discussion of potential sediment input. (Auth.)

F-43155

Ten Brink, U., Stern, T., Beaudoin, B., **Seismic reflection and refraction experiment on the Ross Ice Shelf, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.87-88, 3 refs.

During austral summer 1988-1989 a joint multichannel seismic experiment was carried out to determine the thickness and configuration of the sediment and crustal layers in the vicinity of Ross Island, Antarctica. The objectives of this experiment were twofold: to study lithospheric flexure associated with the emplacement of the large, geologically young (less than 5 million years) volcanic load of Ross Island on the thinned and extended continental lithosphere of the Ross embayment; and to investigate field and processing parameters necessary for seismic reflection work on a thick (200-350 m) high-velocity ice overlying 600- to 800-m-deep water. In this article, the second objective is discussed. Specific aspects of the discussion include profile lengths, channel size, seismic array lengths, string loca-

tion and orientation, shot depth, charge size, and success assessment *vis à vis* other surveys in similar circumstances.

F-43156

Palais, J.M., Chuan, R., Spencer, M.J., **Soluble and insoluble impurities in snow samples from Ross Island, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.89-91, 3 refs.

In this paper, preliminary results are reported of snow-pit and firn-core studies which examine the types of soluble and insoluble particles found in snow samples collected around Mount Erebus, the active volcano on Ross Island. This work is part of a larger study in which aerosol measurements aboard an LC-130 Hercules airplane and on the ground are made to determine whether Mount Erebus has an effect on the chemistry of the antarctic troposphere and on regional ice chemistry. The aerosol measurements are made with a quartz-crystal microbalance, multi-stage cascade impactor to characterize the typical aerosol particles found in the volcanic plume of Mount Erebus, both on the ground at the crater rim and in the air, and in the ambient troposphere. Several aerosol measurements have also been made on the ground but away from the direct effects of the volcano.

F-43157

Zeller, E.J., Dreschhoff, G.A.M., Laird, C.M., **Record of solar proton events in a firn core from Windless Bight, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.92-94, 10 refs.

During the 1988-1989 field season, the high-resolution nitrate analysis of a snow sequence from Windless Bight on the Ross Ice Shelf was undertaken. A firn core was drilled by hand to a depth of 21.7 m. All analytical operations were performed in a portable field laboratory at Williams Field located 7 km from the drill site in Windless Bight. Sampling was accomplished at the drill site. Cores and samples were handled only with cleaned stainless steel implements. In all cases, cores were trimmed to remove any possible contamination from sides or ends. After trimming, 1.5-cm-thick samples were cut sequentially from the core, and each sample was immediately placed in a cleaned, numbered glass vial and sealed with a polyethylene cap. All samples were transported from the drill site to the laboratory on the day that they were collected. They were kept frozen until approximately 1 hour before analysis for nitrate by ultraviolet spectrophotometry. Analyses were always completed within 24 hours of sampling with an analytical precision of within 2 percent for a mean concentration of 16.28 mg/l. The results of the study are shown in figures and discussed.

F-43158

Grootes, P.M., Stuiver, M., **104-meter oxygen-isotope record at J-9, Ross Ice Shelf, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.95-96, 8 refs.

A complete oxygen-isotope profile through the Ross Ice Shelf, Antarctica, Station J-9, 82.4S 168.6W, elevation 60 m, covers at least the last 30,000 years. This profile was obtained from a core drilled in 1978-1979. Reported here is the oxygen-isotope profile of a 104 m core drilled in 1976 about 100 m away from the 1978 core. Comparison of the oxygen-isotope records of the two cores reveals the spatial variability in the core records. This information is needed for a proper interpretation of the paleoenvironmental information in the long record of the 1978 core. The results are expressed as $\delta O-18$, the relative difference between the O-18/O-16 ratio of the sample and that of Standard Mean Ocean Water (V-SMOW), given in parts per thousand (per mill).

F-43159

Mayewski, P.A., Lyons, W.B., Twickler, M.S., **Detailed glaciochemical investigations in southern Victoria Land, Antarctica, 1988-1989—a proxy climate record**, *Antarctic journal of the United States*, 1989 24(5), p.96-97, 1 ref.

The site chosen for these investigations during the 1988-1989 season was the Newall Glacier in the Asgaard Range. The major goal of the 1988-1989 field program was to collect two cores, 150 and 175 m deep; this was accomplished in conjunction with the Polar Ice Coring Office (University of Alaska at Fairbanks). The drill site is located in a relatively flat portion of the glacier close to the heads of the Lacroix, Suess, and Canada glaciers of Taylor Valley. One core will be dedicated to measurements of major anions, major cations, and radionuclides to be conducted in the laboratory, and oxygen isotope measurements to be conducted by P. Grootes (University of Washington). The other core will be sampled in a similar fashion for purposes of calibration and for gas studies (carbon dioxide and methane) by M. Whalen (New York State Department of Health). Prior to final site selection a series of studies was undertaken: radio echo sounding, surveying, mass balancing, snow pit sampling, shallow core sampling, and air sampling.

F-43162

MacDonald, T.R., Ferrigno, J.G., Williams, R.S., Jr., Lucchitta, B.K., **Velocities of antarctic outlet glaciers determined from sequential Landsat images**, *Antarctic journal of the United States*, 1989 24(5), p.105-106, 3 refs.

By use of a modified measurement technique and a computer program developed at the U.S.G.S. in Flagstaff, AZ, the average velocity of 14 outlet glaciers distributed around the coast of Antarctica was successfully measured on sequential (time-lapse) Landsat multispectral scanner images. Fourteen antarctic outlet glaciers were measured: six in West Antarctica, three that discharge through the Transantarctic Mountains, and five in East Antarctica. Average velocities ranged from a low of 0.1 km per year for an unnamed outlet glacier in Marie Byrd Land, to a high of 2.2 km per year for the Pine Island Glacier, also in Marie Byrd Land, which confirms measurements made earlier.

F-43163

Lucchitta, B.K., Ferguson, H.M., Schafer, F.J., Ferrigno, J.G., Williams, R.S., Jr., **Antarctic glacier velocities from Landsat images**, *Antarctic journal of the United States*, 1989 24(5), p.106-107, 1 ref.

A study was undertaken to determine ice velocities on outlet glaciers around the periphery of Antarctica, using pairs of existing Landsat images, each pair covering the same area of coastline. On sequential images, at least two fixed points along the coastline are located and cracks, crevasses, or other features in the floating part of outlet glaciers are identified; these features move with the ice and retain their shape for many years. For positive transparencies, the features are punch registered in a point-transfer device commonly used for the registration of points on stereoisograms, a coordinate system is established, and the translational movement of the points is calculated from the coordinates. For the paper prints, triangulation is used between fixed and moving points: the distances between these points are measured and a computer program calculates the translations. Measurement on positive transparencies shows that velocities of the DeHaven Glacier ranged from 540 m per year near the grounding line to 870 m per year near the breakup of the glacier 8 km from the grounding line. On the Holmes Glacier, the velocities ranged from 890 m per year at 9 km from the grounding line to 1,520 m per year near the breakup of the glacier 35 km from the grounding line.

F-43173

Williams, C., Boies, C., Domack, E.W., **Glacial drainage systems along the Antarctic Peninsula and Palmer Archipelago**, *Antarctic journal of the United States*, 1989 24(5), p.116-117, 3 refs.

Parameters considered in the investigation of marine glacial processes are the size of the system, the longitudinal profile, snow-line elevation, and mass balance changes. To provide background data that help to address these concerns, base maps were constructed which delineate glacial drainage areas and flow-line character. Base maps were drawn on U.S. Defense Mapping Agency coastal charts using Landsat images taken over a number of years. Surface drainage areas were calculated using the method of weights and have methodologic errors of less than 0.1 percent. The results are tabulated and demonstrate that the glaciers along the Davis Coast are several times larger than glaciers which drain into fjords of the Danco Coast and Palmer Archipelago.

F-43181

Jacobs, S.S., Comiso, J.C., **Satellite microwave sea-ice observations and oceanic processes on the antarctic continental shelf**, *Antarctic journal of the United States*, 1989 24(5), p.135-136, 3 refs.

This project progress review cites several dominant conditions developed from satellite surveillance during the period 1979-1986: a persistently lower ice cover over the continental shelf than above the adjacent deep ocean; identification of two new polynyas near the continental break; and the stability of winter sea ice concentration on the shelf, averaging 86%, and showing little sensitivity to present day atmospheric variability. Some of the reasons for these occurrences are discussed, along with some necessary precautions in the interpretation of brightness temperatures in the satellite observations.

F-43183

Gordon, A.L., Huber, B.A., **Winter sea-ice cover and ocean processes**, *Antarctic journal of the United States*, 1989 24(5), p.140-142, 4 refs.

This report presents a summary of the conceptual view regarding the relationship of the southern ocean sea-ice cover to oceanic processes that the authors have developed since the winter and spring field programs of the *Somov*, 1982 and *Polarstern*, 1987. Discussion with colleagues interested in mixed-layer modeling have benefited this development. Within the Weddell Gyre, there is a delicate balance between the thin veneer of sea ice and entrainment of deep water, with its relative warmth and saltiness, into the winter mixed layer. The interrelationships of these characteristics and the processes they engender are discussed.

F-43212

Dreschhoff, G.A.M., Zeller, E.J., **Evidence of individual solar proton events in antarctic snow**, *Solar physics*, June 1990 127(2), p.333-346, 48 refs.

The nitrate concentration in a firn core was measured in Antarctica by ultraviolet spectrophotometry under tightly controlled experimental procedures. Based on uninterrupted, high-resolution sampling, variations in nitrate concentration were found to average about 53% (one standard deviation) of the mean concentration for the entire core. Short pulses of high nitrate concentration were found to show a variance of up to 11 standard deviations above the mean. At the series mean, the precision of analysis is better than 2%. The firn core was drilled by hand to a depth of 21.7 m corresponding to 62 years and including more than 5 solar cycles. The time series that resulted from a total of 1393 individual analyses shows a statistically significant modulation of the background signal that is clearly traceable to solar activity. Several anomalously large concentration peaks were observed that have been dated and found to correlate with the major

solar proton events of Aug. 1972, July 1946, and the white-light flare of July 1928. (Auth. mod.)

F-43254

Clapperton, C.M., Sugden, D.E., **Late Cenozoic glacial history of the Ross Embayment, Antarctica**, *Quaternary science reviews*, 1990 9(2/3), p.253-272, Refs. p.271-272.

For the Late Quaternary, reconstructed ice surface profiles, based on detailed mapping and dating of drift sheets, show that large outlet glaciers from East Antarctica's polar plateau became about 1000 m thicker during glaciation maxima, while the plateau ice barely thickened at all. This is attributed to extensive northward migration of the ice grounding line in the Ross Embayment as global sea level fell. Dates obtained from the drift sheets confirm that glaciers in the Ross Embayment area reached maximal limits at 190-160 ka BP and at 23-14 ka BP. Recession from the last glaciation maximum was underway by 13 ka BP and was complete by ca. 6 ka BP. Alpine glaciers terminating in the Dry Valleys fluctuate asynchronously with the Ross Embayment glaciers; they retreat during glacial maxima when they become starved of accumulation, and readvance during warmer intervals. Because of their dependence on grounding line position, glacier fluctuations in much of Antarctica are primarily led by sea level changes controlled by ice sheets in the Northern Hemisphere. (Auth. mod.)

F-43255

Clapperton, C.M., **Quaternary glaciations in the Southern Hemisphere: an overview**, *Quaternary science reviews*, 1990 9(2/3), p.299-304, 28 refs.

Large glacier systems in Antarctica have existed at least since the Early Miocene. There is evidence of glaciation during Oxygen Isotope Stages 10.8 and 6 in several parts of the Southern Hemisphere, but the only well dated advance of the Middle Quaternary is that of Stage 6 in the Transantarctic Mountains. During the last glaciation, montane glaciers in parts of the Southern Hemisphere were as large during Isotope Stage 4 as during Isotope Stage 2. (Auth. mod.)

F-43256

International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988, Rado, C., ed, Beaudoin, D., ed, **Ice core drilling**, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, 205p., Refs. passim. For individual papers see 45-1447 through 45-1472 or F-43257 through F-43268.

This is a collection of papers presented at the 3rd International Workshop on Ice Drilling Technology, held on Oct. 10-14, 1988 in Grenoble, France. Twelve of the papers presented are pertinent to Antarctica, and discuss ice core drilling (electromechanical, thermal, hot water) and ice core processing and quality.

F-43257

Bässler, K.H., Kohnen, H., **German intermediate ice core drilling since 1981: technique and experience**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.3-5, 4 refs.

The development of a Rufli type drill system for electromechanical ice coring, its use at several locations in the Antarctic, and future modifications based on experience during field work are outlined. A short video record, taken during the German Antarctic Expedition in 1987 in the Ritscher Upland and the Ekström ice shelf, gives an impression of the drill procedure and occurring problems. (Auth.)

F-43258

Koci, B.R., **Design and logistic requirements for ice coring and sample return from remote high altitude locations**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.24-27.

A description of the drilling systems, power sources applicable to high altitudes such as Antarctica, and equipment/core packaging for long rough journeys are considered. Electromechanical and thermal drilling systems are discussed, along with the use of composites, solar, wind and mechanical generation systems. (Auth. mod.)

F-43259

Schwander, J., Rufli, H., **Electromechanical drilling in dry holes to medium depths**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.32-37, 5 refs.

In reviewing factors limiting the depth for the production of good quality ice cores, the bore-hole closure is discussed from results based on measured first year strain rates of two holes, one at Byrd Station. The latest version of a mechanical drill system which has been modified to produce better cores from greater depths is presented.

F-43260

Hancock, W.H., Koci, B.R., **Ice drilling instrumentation**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.38-50, 11 refs.

Two types of instrument packages for monitoring the ice drilling process have been designed. Both are mounted in the drill and return information to the surface during drilling. One was used on a hot water drill during the Nov.-Dec. 1987 summer season in Antarctica. It was powered and controlled from the surface with the data conversion being done using a commercial board in a Compaq computer. The designs and types of data collected are discussed. (Auth. mod.)

F-43261

Gundestrup, N.S., **Hole liquids**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.51-53, 7 refs.

In deep drilling, the hole must be filled with a liquid in order to prevent hole closure from the surrounding ice. The maximum depth received in a dry hole is 906 m at Dome C using a thermal drill in ice. Mechanical drills have a more limited depth capability in a dry hole than a thermal drill due to the lack of clearance at the drill head. Nevertheless, it was possible to core 360 m at South Pole (-55 C) and 325 m at Renland in East Greenland (-18 C). In deeper drillings, the hole has to be filled with a liquid. (Auth. mod.)

F-43262

Augustin, L., Donnou, D., Rado, C., Manouvrier, A., Girard, C., Ricou, G., **Thermal ice core drill 4000**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.59-65, 1 ref.

The "Laboratoire de Glaciologie et Géophysique de l'Environnement" has developed since 1968 a thermal-drill system, which reached 905 m in depth during the summer season 1977-78 at Dome C. In order to reach deeper layers, the system had to be modified for working in a fluid filled hole.

F-43263

Donnou, D., Augustin, L., Manouvrier, A., Perrin, J., Girard, C., Ricou, G., **Setting up a deep ice core drilling facility and preliminary tests: Terre Adelie-Antarctica**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.66-69.

The goal of the summer 1987-88 field operations was to test the thermal drill equipment designed to work in a fluid filled hole on the Adélie Coast. The drilling equipment, designed for recovery of very deep ice cores within one summer season, the hydraulic power station, and the assembly of the tower are described and illustrated.

F-43264

Etheridge, D.M., Wookey, C.W., **Ice core drilling at a high accumulation area of Law Dome, Antarctica, 1987**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.86-96, 8 refs.

A 234 m deep 195 mm diameter ice core was drilled at DEO8, 16 km east of the Law Dome summit in 1987. The details of the thermal drill facility are described. The ice core and borehole were measured and sampled on-site for all principal parameters and showed that the core reached back to about 1810 AD. The snow accumulation rate at the drill site is about 1200 km/sq m/a and surface melting is very infrequent. The suitability of the core for gas composition studies and other analyses is discussed. (Auth.)

F-43265

Morev, V.A., Manevskiĭ, L.N., Iakovlev, V.M., Zagorodnov, V.S., **Drilling with ethanol-based antifreeze in Antarctica**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.110-113.

An account is given of antifreeze-thermal drilling in Antarctica. Tabulated data on the boreholes drilled with antifreeze-thermal technology, showing year and site of the drilling, type of ice or firn, borehole temperature and other characteristics, are presented.

F-43266

Koci, B.R., **Deep hot water drill system with potential for bottom sampling**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.137-139, 2 refs.

During the 1987-88 antarctic season, a hot water drilling system capable of drilling up to 3,000 m was tested. By insulating a one inch diameter hose, the heat loss is reduced so water temperature at the nozzle falls off by 2 C/100 m of water depth. In addition, wires incorporated in the jacket allow measurement while drilling to assure hole straightness and large enough diameter to permit instrument raising and lowering. Heat input for this system is 0.5 W. Some ideas are presented on drilling subglacial material. Saturated till sampling requires a tool used by the well drilling industry for sampling material below the water table, while rock sampling and coring of frozen till utilize mining technology. The use of additives to enhance drilling rates is also discussed. (Auth.)

F-43267

Stauffer, B., Burkhalter, J., Sigg, A., **New methods in ice core processing**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.151-157, 2 refs.

Core processing includes the inspection, registration, labelling and packing of ice cores as well as first measurements in the field. The methods of core processing applied during core drillings at Dye 3 and South Pole are presented. A modified version that will be applied in summer 1989 in Central Greenland is discussed in more detail. (Auth.)

F-43268

Boutron, C.F., Patterson, C.C., Barkov, N.I., **Assessing the quality of thermally drilled deep antarctic ice cores for trace elements analysis**, International Workshop on Ice Drilling Technology, 3rd, Grenoble, France, Oct. 10-14, 1988. Proceedings. Ice core drilling. Edited by C. Rado and D. Beaudoin, Grenoble, France. Centre National de la Recherche Scientifique. Laboratoire de Glaciologie et Géophysique de l'Environnement, 1989, p.182-197, 19 refs.

Concentrations of Pb, Zn, Na, Mg, K, Ca, Fe and Al have been measured in successive veneers of ice, mechanically chiselled progressing from the outside to the very center of various sections of the Dome C and Vostok deep ice cores. Mean elemental contamination present in the outside layer of the cores was found to range from 0.3 ng/g (Al) up to 20 ng/g (Na) for the Dome C core, and from 5 ng/g (Al) up to 290 ng/g (Zn) for the Vostok core. Contrasting outside-inside curves were observed for the various elements. Plateaus of concentrations were obtained in the inner parts of the core sections in all cases for Na and Mg, and in most cases for K, Ca, Fe and Al. For Pb and Zn, on the other hand, plateaus were observed only for part of the sections. (Auth. mod.)

F-43271

Bogorodskii, V.V., ed, Gavrilov, V.P., ed, **Electro-physical and physical-mechanical properties of ice** [Elektrofizicheskie i fiziko-mekhanicheskie svoïstva l'da], Leningrad, Gidrometeoizdat, 1989, 256p., In Russian. Refs. passim. For individual papers see 45-1484 through 45-1509 or F-43272 through F-43277.

This work discusses results of theoretical, laboratory, and field studies on a range of physical characteristics of snow, sea ice, and glacial covers in arctic and antarctic regions. Electro-physical parameters and the electrical structure of sea ice in the UHF range as well as the results of studies of the velocity of radio wave propagation in glaciers are discussed. A series of articles is devoted to radio waves of snow and ice covers, and questions on the interpretation of remote ice sensing. Data from results of physical modeling of frazil ice formation and space-oriented crystal structures of ice cover are presented. Questions on ice mechanics relating to ice breakup are also examined. (Auth. mod.)

F-43272

Bogorodskii, V.V., Pasyukov, V.V., Khokhlov, G.P., **Electrical parameters of surface layers of shelf and continental glaciers in the UHF range** [Elektricheskie parametry poverkhnostnykh sloev shel'fovogo i materikovogo lednikov v SVCh diapazone], Elektrofizicheskie i fiziko-mekhanicheskie svoïstva l'da (Electro-physical and physical-mechanical properties of ice). Edited by V.V. Bogorodskii and V.P. Gavrilov, Leningrad, Gidrometeoizdat, 1989, p.23-31, In Russian. 6 refs.

Results of experimental investigations of the electrical parameters of glacier ice in the area of Novolazarevskaya Station are presented. Distributions of electrical parameters were obtained for 3 areas of ice formation, differentiated by the structure and physical characteristics of the surface layers of the glacier mass. The results obtained allow a better understanding of the nature of thermal radio wave emissions of antarctic glaciers and make it possible to evaluate remote r-f methods of studying ice covers. (Auth. mod.)

F-43273

Trepov, G.V., **Attenuation of 3-cm band radar signals by snow cover in the Antarctic** [Oslablenie radiolokatsionnykh signalov trekhsantimetrovogo diapazona v snezhnom pokrove Antarktidy], Elektrofizicheskie i fiziko-mekhanicheskie svoïstva l'da (Electro-physical and physical-mechanical properties of ice). Edited by V.V. Bogorodskii and V.P. Gavrilov, Leningrad, Gidrometeoizdat, 1989, p.53-58, In Russian. 2 refs.

Experimental results from radar sounding of snow cover in Antarctica show that the maximum depth of penetration of the snow mass by radio waves is determined primarily by the number of permeable ice crust-boundaries of annual snow layers. The attenuation value of the signal during the penetration of one ice crust in the snow was obtained. (Auth. mod.)

F-43274

Sheremet'ev, A.N., **Measuring the velocity of electromagnetic wave propagation in a glacier on Dome B in Antarctica** [Izmerenie skorosti rasprostraneniia elektromagnitnykh voln v lednike na kupole "B" v Antarktide], Elektrofizicheskie i fiziko-mekhanicheskie svoïstva l'da (Electro-physical and physical-mechanical properties of ice). Edited by V.V. Bogorodskii and V.P. Gavrilov, Leningrad, Gidrometeoizdat, 1989, p.59-64, In Russian. 1 ref.

The author analyzes measurements of the velocity of electromagnetic wave propagation in ice (obtained by oblique sounding) on a glacier over 3500 m thick, located on the surface of a subglacial lake. (Auth. mod.)

F-43275

Sheremet'ev, A.N., **Radar measurements of the thickness and movement velocity of ice cover in the area of Dome B** [Radiolokatsionnye izmereniia tolshchiny i skorosti dvizheniia lednikovogo pokrova v raione kupola "B"], *Elektrofizicheskie i fiziko-mekhanicheskie svoïstva l'da* (Electro-physical and physical-mechanical properties of ice). Edited by V.V. Bogorodskii and V.P. Gavrilov, Leningrad, Gidrometeoizdat, 1989, p.65-71, In Russian. 1 ref.

The author analyzes measurements of the thickness and movement velocity of ice cover in the region of Dome B in the central part of Antarctica, obtained during the 28th and 29th Soviet Antarctic Expeditions. From the measurements it was possible to determine the center of the flow of the ice, where the velocity of the glacier is minimal and amounts to about 0.1 m/year. (Auth. mod.)

F-43276

Nazintsev, I.U.L., Tyshko, K.P., **Characteristics of the distribution of the volume of air and brine pockets in sea ice** [Nekotorye osobennosti raspredeleniia ob'ema por s vozdukhom i rassolom v morskikh l'dakh], *Elektrofizicheskie i fiziko-mekhanicheskie svoïstva l'da* (Electro-physical and physical-mechanical properties of ice). Edited by V.V. Bogorodskii and V.P. Gavrilov, Leningrad, Gidrometeoizdat, 1989, p.109-123, In Russian. 19 refs.

The authors present the results of their calculations of the relative volume of air and brine pockets found in different layers of ice cover. The calculations made were based on data obtained from investigations of sea ice in the Arctic and Antarctica. Statistical analysis of the distribution of the volume of pockets in ice of different ages and conditions is included. (Auth. mod.)

F-43277

Cherepanov, N.V., Strakhov, M.V., **Laboratory studies of oriented growth of ice crystals in moving water streams** [Laboratornye issledovaniia orientirovannogo rosta kristallov l'da v dvizhushchemsia vodnom potoke], *Elektrofizicheskie i fiziko-mekhanicheskie svoïstva l'da* (Electro-physical and physical-mechanical properties of ice). Edited by V.V. Bogorodskii and V.P. Gavrilov, Leningrad, Gidrometeoizdat, 1989, p.144-153, In Russian. 9 refs.

Questions related to the occurrence of space-ordering in the crystal structure of sea ice and its distribution in arctic and antarctic sea ice are examined, and the causes of such ordering are discussed. From the analysis of the obtained results, some regularities in the formation of ice with ordering in the C-axis orientation of the crystals, depending on the flow regime, were revealed. (Auth. mod.)

F-43281

Moore, J.C., **Geophysical aspects of ice core drilling in Antarctica**, Cambridge, England, British Antarctic Survey, 1988, 168p. + appends., Ph.D. thesis. Refs. p.156-168.

Using geophysical techniques and ice core analyses, a comprehensive study has been made of the ice sheet of Dolleman I., an ice rise on the east coast of the Antarctic Peninsula. A new technique for the rapid dielectric profiling of ice cores has been developed which

is about fifty times quicker than earlier methods of similar accuracy. The technique makes continuous profiling of ice cores a practical procedure. The interpretation of the dielectric results clearly shows that dielectric parameters provide a comparable stratigraphy to that obtained by conventional chemical techniques. A statistical analysis of the dielectric and chemical measurements for a 45 m length of ice core shows that the high frequency conductivity is determined both by neutral salt and by acid concentrations. Two separate processes determine the high frequency conductivity: acids (probably in liquid form at three grain boundaries) determine the d.c. conductivity, whilst salts (probably dispersed throughout the ice fabric) determine the dielectric conductivity. The salt conduction mechanism is probably due to Bjerrum L defects alone. These results are the first ever to allow a comprehensive comparison of dielectric and chemical data from natural ice. The high frequency conductivity profile from the 133 m long Dolleman core has been used to generate synthetic 'radar-grams'. These show features that correspond to the internal reflections often seen when radar sounding polar ice sheets. In parallel with the dielectric study, a resistivity survey of the drilling area was completed, the borehole temperature profiled and an ice flow stake scheme surveyed. The results of these surveys indicate that strain rates are changing rapidly, and the temperature at the base of the ice rise is close to 0 C. The causes of these results are discussed, and the most likely explanation found to be a change in the bed condition from sliding to non-sliding motion. (Auth. mod.)

F-43302

Kato, K., Corte, A.M., Fukuda, M., **Chemical and isotopic characteristics of ice from an ice-wedge in Seymour Island (Isla Vcom. Marambio), Antarctic Peninsula region (1)**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.181-190, 6 refs.

Chemical analyses of ice samples from ice wedges and ice-wedge casts found in ice free areas of Seymour I. are discussed. Results show that concentrations and composition of chemicals vary significantly between the upper and lower portion of the ice body. It is concluded that this might provide useful information about the origins and formation processes of ice wedges.

F-43315

Humphrey, N., Echelmeyer, K.A., **Hot-water drilling and bore-hole closure in cold ice**, *Journal of glaciology*, 1990 36(124), p.287-298, 17 refs.

Drilling bore holes in deep, cold ice masses by hot-water methods and maintaining these holes with sufficient diameter to allow down-hole experimentation poses a major obstacle to the investigation of conditions beneath ice sheets and ice streams. Closure of the water-filled holes by refreezing is the dominant difficulty. In this paper, calculations of heat transfer from the drilling system to the ice and the subsequent time-dependent motion of the phase boundary defining the bore-hole wall are described. Results are presented with the view of optimizing the bore-hole radius at depth for a fixed drill performance and a variable rate of drilling. Calculation of melting/refreezing rates at the bore-hole wall requires the use of a one-dimensional, time-dependent numerical heat-flow model with a distorting mesh which follows the changing hole size. The delay of hole closure is discussed with a view to keeping holes open long enough to allow instruments to be lowered to the glacier bed, while realizing that drilling-system performance may be marginal because of logistical and/or expenditure constraints. The relative merits of drilling a large hole, which is very time consuming with a small drill, and the use of water-soluble antifreezes, which have a history of creating plugs of ice slush, are discussed. A method of creating a stable hole filled with antifreeze in which ice slush does not occur is described. The recent application of these theoretical ideas to the planning and implementation of successful hot-water drilling programs in Antarctica and Greenland is also presented. (Auth.)

F-43316

Lange, M.A., Schlosser, P., Ackley, S.F., Wadhams, P., Dieckmann, G.S., **O-18 concentrations in sea ice of the Weddell Sea, Antarctica**, *Journal of glaciology*, MP 2807, 1990 36(124), p.315-323, 34 refs.

Data are presented on ice texture, salinity, and $\delta^{18}\text{O}$ obtained from identical sections of ice cores during the Winter Weddell Sea Project 1986 on RV *Polarstern* from July through Aug. 1986, in the longitude range between 5W and 7E. No uniquely definable relationship between $\delta^{18}\text{O}$ values and ice texture in a particular section is found. However, most of the snow ice as well as some sections of frazil ice are found to have negative $\delta^{18}\text{O}$ concentrations, due to varying degrees of admixtures of meteoric ice (snow) and sea-water during formation of snow ice. In contrast to common assumptions, these results seem to indicate that a snow cover contributes positively to sea-ice growth rather than slowing down the overall growth rate. Based on a simple model, the contributions of meteoric ice (mean of $3 \pm 3\%$) and the combined meteoric ice/sea-water fraction (a minimum of $7 \pm 6\%$) to the total ice thickness for the majority of the sampled floes are estimated. Although this is only a moderate contribution to the overall mass balance, in the absence of congelation growth it nevertheless enhances ice growth in general. This hypothesis is independently supported by snow- and ice-thickness data which demonstrate that the depression of the snow/ice interface below the water line (i.e. a negative freeboard) and the formation of snow ice is a common occurrence in the Weddell Sea. Therefore, it is hypothesized that the major part of the observed apparent increase in ice thickness between the inbound and outbound tracks of WWSP'86 may not be derived from "regular", thermodynamically driven congelation growth, but rather from the snow-ice component in floes of the Weddell Sea. (Auth. mod.)

F-43317

Delisle, G., **Recent change in ice thickness in Windless Bight, Ross Ice Shelf, Antarctica?**, *Journal of glaciology*, 1990 36(124), p.350-351, 9 refs.

Ice thickness data sets derived at two different periods, the first in the 1960s and the second in 1985, in Windless Bight, Ross Ice Shelf, are compared. The earlier set was based on both seismic and radar soundings, while the later included only radar soundings. While the comparison indicates that the ice shelf has thinned in the last twenty-five years, the results are equivocal due to uncertainty concerning the possibility that brine layers within the ice shelf have, by absorbing radio waves, distorted reflectivity data. This occurrence, however, is considered unlikely. Possible mechanisms suggested to account for ice thinning include bottom melting, reduction in the flow velocity of Terror Glacier, and geothermal heating from volcanic activity, which would also alter glacier velocities.

F-43345

Vtiurin, B.I., **Glaciological and geocryological investigations on Novolazarevskaya Station** [Gliatsiologicheskie i geokriologicheskie issledovaniia na stantsii Novolazarevskoi], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.86, p.93-104, In Russian.

Field investigations carried out by SAE 27 in Schirmacher Ponds Nov. 1981 to Mar. 1982 are reviewed. Detailed discussion covers shelf ice motion and melting, continental and lacustrine ice structure, glacial deposits and evolution, dynamics of seasonal freezing and thawing of rocks, cryogenic processes and evolution, and cryogenic structure of rocks. Geocryological observations were mostly made on the ground of Novolazarevskaya Station.

F-43346

Korotkov, A.I., **Mechanism of frazil ice formation in the Antarctic** [O mekhanizme obrazovaniia vnutrivodnogo l'da v Antarktike], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.86, p.105-116, In Russian. 29 refs.

Due to problems related to studies of frazil ice formation, a classification of types of frazil ice, based on the depth of its formation, is proposed. Considering one of the possible formation and development variations of the process observed in Alasheyev Bight, the author points out that the cause of frazil ice formation is the supercooling of ocean water, and that the primary cause of water supercooling is the intense heat release of open-surface waters in the fall and winter seasons.

F-43347

Korotkov, A.I., **Variability of natural conditions in Alasheyev Bight** [Izmenchivost' prirodnykh uslovii v zalive Alasheeva], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.86, p.117-133, In Russian. 19 refs.

Basic elements of the sea ice regime in Alasheyev Bight, covering the period from 1962 to 1986, are summarized and tabulated data are presented. The variability and peculiarity of ice processes in the Bight are linked to the development of stationary polynyas; this development occurs in 3 stages and is related to atmospheric circulation. It is found that polynyas are an obstacle to the formation and growth of the ice cover in the studied region.

F-43348

Bagriantsev, N.V., **Large-scale features of ice cover formation in the Weddell gyre region** [Krupnomashtabnye cherty formirovaniia ledianogo pokrova v oblasti krugovorota Ueddella], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.86, p.134-151, In Russian. 22 refs.

Presented are data on the yearly cycle of ice cover formation in the Weddell gyre area during Mar. 1983-Mar. 1984, and on the ice edge position and the distribution of polynyas in the Weddell Sea during 1974-1976. Also presented are data evaluating the heat transfer necessary for the ice cover formation in the eastern portion of the Weddell gyre, an area free of ice during the months of May and June. The cause of ice cover weakening in that region is discussed, relating features of large-scale circulation of the southern ocean and the atmosphere over it.

F-43350

Krivoshein, V.K., **Structure and dynamics of the Pacific ice massif** [O strukture i dinamike Tikookeanskogo ledianogo massiva], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.86, p.165-174, In Russian. 6 refs.

Data on Pacific Ocean ice cover conditions, ice edge position and sea ice distribution during Jan., Feb. and Mar. of 1981 are discussed and presented on graphs. In mid Jan., the surface area of the Pacific ice massif measured 400 thousand sq. km., surpassing the average measurements typical for that time of year. Similarly, toward the end of Feb. and beginning of Mar., the ice covered a surface of 1 million sq. km., against the average measurements of 150 thousand sq. km. in former years.

F-43366

Bentley, C.R., ed, Hayes, D.E., ed, **Ross Ice Shelf: glaciology and geophysics**, *American Geophysical Union. Antarctic research series*, 1990 Vol.42, 126p., Refs. passim. For individual papers see F-43367 through F-43369 or 45-1610 through 45-1612.

Papers 3, 4 and 5 are presented in this volume of "The Ross Ice Shelf: Glaciology and geophysics", dealing with seismic studies on the grid western half of the Ross Ice Shelf, seismic studies on the grid eastern half of the Ross Ice Shelf, and short refraction studies using an analytical curve-fitting technique, respectively.

F-43367

Robertson, J.D., Bentley, C.R., **Seismic studies on the grid western half of the Ross Ice Shelf: RIGGS I and RIGGS II**, *American Geophysical Union. Antarctic research series*, 1990 Vol.42, Ross Ice Shelf: glaciology and geophysics, p.55-86, Refs. p.84-86.

Airlifted geophysical surveys were carried out on the grid western half of the Ross Ice Shelf during the austral summers of 1973-1974 and 1974-1975, as part of the Ross Ice Shelf Geophysical and Glaciological Survey (RIGGS). Seismic reflection records were obtained at 76 stations, seismic long-refraction records at four stations, radar-sounding reflection records at 93 stations, and gravity measurements at 89 stations. The seismic results, supplemented by radar-sounding measurements of ice thickness, are discussed here. There is S wave velocity anisotropy in the firn that probably is caused by layered structure, but comparison between seismic and radar echo times shows no evidence of an average preferred orientation of crystallographic c axes in the body of the ice shelf. A complete listing of ice and water layer thicknesses and ocean bottom elevations is given. (Auth. mod.)

F-43368

Albert, D.G., Bentley, C.R., **Seismic studies on the grid eastern half of the Ross Ice Shelf: RIGGS III and RIGGS IV**, *American Geophysical Union. Antarctic research series*, MP 2813, 1990 Vol.42, Ross Ice Shelf: glaciology and geophysics, p.87-108, Refs. p.107-108.

Seismic P wave refraction experiments at three locations on the Ross Ice Shelf during 1976-1977 (RIGGS III) and 1977-1978 (RIGGS IV) reveal that the velocity increases monotonically in the firn from about 500 m/s at the surface to about 3800 m/s at a depth of 60 m. Maximum P wave velocities measured at 4 locations on the ice shelf show a large range of values primarily indicative of lateral inhomogeneities, but perhaps also resulting from anisotropy. Water depths for 89 additional stations were determined using seismic reflections from the ocean floor, together with ice thicknesses measured by radar and seismic techniques. Systematic differences that appear between ice thicknesses measured by the two techniques on RIGGS IV but not on RIGGS III most likely reflect an unrecognized systematic error in measurement. (Auth. mod.)

F-43369

Kirchner, J.F., Bentley, C.R., **RIGGS III: seismic short-refraction studies using an analytical curve-fitting technique**, *American Geophysical Union. Antarctic research series*, 1990 Vol.42, Ross Ice Shelf: glaciology and geophysics, p.109-126, Refs. p.125-126.

Several short-refraction profiles completed on the Ross Ice Shelf during the 1976-1977 summer season (RIGGS III) have been analyzed and interpreted. Instead of estimating slopes from the travel time curves graphically, the travel times were fit with an analytical function of a hybrid exponential and linear form by means of a nonlinear regression computer program. Differentiation of the resulting expression for the best fitting curve produces the velocity-distance function. Comparisons of P waves and S waves (both horizontally and vertically polarized) along different azimuthal directions at 3 sites indicate substantial anisotropy in at least the upper 30-40 m, and show further that transverse isotropy cannot serve as a good model for this region. Velocity gradients calculated and fit segmentally by exponential functions yielded estimates of depths to different densification horizons. (Auth. mod.)

F-43375

Wadhams, P., Crane, D.R., **SPRI participation in the Winter Weddell Gyre Study 1989**, *Polar record*, Jan. 1991 27(160), p.29-38, 17 refs.

The Winter Weddell Gyre Study was conducted by an international group of scientists, including members of the Scott Polar Research Institute, from FS *Polarstern* (FRG) in Sep. and Oct. 1989, in collaboration with RV *Akademik Federov* (USSR). This was a multidisciplinary experiment involving biologists, chemists, oceanographers and meteorologists. The SPRI program involved measuring ice thickness; studying the under-ice topography with an upward looking sidescan sonar; investigating the acceleration, tilt and strain of the ice; deploying Argos buoys; aerial photography; iceberg tracking; and two acoustic experiments, one to record ambient noise and the other to acoustically measure the ice thickness. (Auth. mod.)

F-43386

Hibler, W.D., III, **Modelling sea ice thermodynamics and dynamics in climate studies**, MP 2819, NATO Advanced Study Institute on Physically-Based Modelling and Simulation of Climate and Climate Change, Part 1. Proceedings, edited by M.E. Schlesinger, Dordrecht, Kluwer Academic Publishers, 1988, p.509-563, 47 refs.

DLC QC980.N37 1986 pt.1

The presence of sea ice cover substantially modifies air-sea heat and momentum exchanges in the polar regions, and hence can play a major role in high-latitude climate sensitivity. Because of its mobility, the dynamics and thermodynamics of this ice cover are intrinsically related. The purely thermodynamic properties of sea ice are very dependent on the fact that it is an admixture of brine pockets and fresh water ice. This causes sea ice to have a greater equilibrium thickness than freshwater ice and to have a different seasonal cycle of thickness change. The dynamical features of sea ice are characterized by a highly nonlinear ice interaction that causes the ice pack to strongly resist compression while having a relatively weak resistance to dilation. The strength of the interaction is tied to the amount of thin ice which is created by the opening of leads and is removed by ice growth or pressure ridging. A plastic rheology offers a consistent means of modelling this highly nonlinear ice interaction. Results of several numerical simulations are discussed; these include the response of an antarctic sea ice model to atmospheric warming, and the behavior of a coupled ice-ocean model of the Arctic, Greenland and Norwegian seas. In the case of ice-ocean coupling it is shown that the ocean circulation is essential for realistic simulation of the ice margin in the Greenland and Norwegian seas. (Auth. mod.)

F-43387

Meier, M.F., **Role of land ice in present and future sea-level change**, Sea-level change, Washington, D.C, National Academy Press, 1990, p.171-184, 76 refs.

DLC GC89.S413

This chapter reviews present knowledge of the response of ice sheets and glaciers to climate change and the consequent effect on sea level, for the next 100 yr. Glaciers other than the two existing ice sheets are currently wasting, and this has contributed about 0.46 mm/yr to sea-level rise since 1900. The Greenland Ice Sheet now appears close to a state of balance. The Antarctic Ice Sheet may be growing at a rate equivalent to about 0.6 mm/yr of sea-level fall; on the other hand, the rate of iceberg discharge may have been underestimated and it may be close to balance. Calculation of future changes of the Greenland Ice Sheet, the arctic ice caps, and the marginal areas in Antarctica requires study of the complex fluid mechanics/thermodynamics of subfreezing snow and firn subjected to water percolation. Determination of changes in iceberg calving is difficult because little is known about the rate-controlling processes; in addition, changes in the geometry of a glacier or ice stream cause changes in the rate of basal sliding, a process that is still imperfectly understood. A warmer

climate may cause warmer ocean water to intrude under the floating ice shelves of Antarctica, causing increased basal melt and ice shelf thinning. This may reduce the back pressure on the ice streams that flow into the shelves, causing the ice streams to accelerate. This process could deplete the ice sheet, producing a sea-level rise of up to 0.3 m, or possibly more, by the year 2100. Complete disintegration of the West Antarctic Ice Sheet is not likely for many centuries or millennia. Increased accumulation on Antarctica could contribute to sea-level fall by 0.1 to 0.5 m in the next 100 years. Long-term questions include the rapid fluctuations in CO₂ and other variables observed in ice cores, the rapid deglaciation of North America at the end of the last ice age, and the possible disappearance of the West Antarctic Ice Sheet due to present-day and near-future processes. (Auth. mod.)

F-43428

Boutron, C.F., Patterson, C.C., Barkov, N.I., **Occurrence of zinc in antarctic ancient ice and recent snow**, *Earth and planetary science letters*, Dec. 1990 101(2/4), p.248-259, 30 refs.

Concentrations of zinc (Zn) have been measured in various sections of the Dome C and Vostok deep antarctic ice cores, whose ages range from 3850 to 155,000 years BP, and in several large surface antarctic snow blocks collected in Adélie Land and at the geographic South Pole. All the samples were mechanically decontaminated, and detailed outside-inside variation profiles were drawn for most of them, allowing us to clearly establish the accuracy of the data obtained from the analysis of the most central parts of each individual core section or snow block. Natural Zn concentrations have strongly varied in antarctic ice during the past 155,000 years, the highest values (up to about 100 pg Zn/g) being observed during the Last Glacial Maximum and possibly during the end of the next-to-last ice age. Wind-blown dust from crustal rock and soil appears to be the main natural source of Zn during the glacial periods, especially the Last Glacial Maximum. Zn concentrations in present-day antarctic snow from central East Antarctica, about 5 pg Zn/g, are comparable with those in Holocene ice several thousand years old, which is evidence that the antarctic tropospheric cell is still little affected by anthropogenic Zn. (Auth.)

F-43450

Jenkins, A., Doake, C.S.M., **Ice-ocean interaction on Ronne Ice Shelf, Antarctica**, *Journal of geophysical research*, Jan. 15, 1991 96(C1), p.791-813, Refs. p.812-813.

Detailed glaciological studies have been completed at 28 sites lying on an approximate flow line, extending 760 km across Ronne Ice Shelf. Parameters measured at each location include ice velocity, thickness, principal strain rates, surface elevation, temperature, and accumulation rate. The data have been used in a steady state model to derive the basal mass flux and the temperature profile with depth at each site. These calculations indicate basal melting in excess of 1 m/yr over the first 100 km of the flow line downstream of the grounding line, where the ice shelf is 1200-1600 m thick. The maximum melt rates in this region occur near the inland margin and exceed 4 m/yr. Freezing then dominates up to the final 100 km before the ice front, causing accumulation of a layer of basal sea ice up to 50 m thick. This is rapidly removed as melt rates increase to over 6 m/yr at the ice front. Dense saline water, which is formed over the continental shelf during winter when the sea surface freezes, drains into the deepest parts of the sub-ice-shelf cavity. At the inland margin, where this water mass contacts the ice shelf, its temperature is 1 C above the local pressure freezing point. Melting of ice results, producing a buoyant outflow of cold, relatively fresh water, along the ice shelf base. Basal freezing occurs towards the ice front, where the ascending water becomes supercooled. This circulation has important implications for the production of Antarctic Bottom Water and for the response of the ice shelf to driving stresses, through the temperature-dependent viscosity of ice. (Auth. mod.)

F-43453

Grigorian, S.S., Ignat'eva, I.IU., Shumskii, P.A., **Thermomechanics of the East Antarctic Ice Sheet** [Termomekhanika lednikovogo shchita Vostochnoi Antarktidiy], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovanii*, Jan. 1990 Vol.68, p.44-51, In Russian with English summary. 18 refs.

The two-dimensional, time-dependent mathematical model of the East Antarctic Ice Sheet presented in this paper is based on temperature parametrization. The parametrization describes the distribution of temperature in a glacier in relation to the surface temperature, advection of ice, dissipative heat and geothermal flux. The area of glaciation is assumed to be limited by the line of up-floating of ice under the interaction of the ice sheet with the sea, where conditions of hydrostatic equilibrium and strain stresses exist. A 46x66 point grid with 66 km spacing has been used to represent the ice-sheet surface, bedrock, accumulation rate and surface temperature. According to computations, steady state will be reached in 20,000 years. Response of the ice sheet to variations of accumulation rate and surface temperature is investigated. Insignificant changes of climatic parameters cause considerable changes of ice thickness in the center of the ice sheet. Changes in the location of the boundary and thickness of the ice sheet in the peripheral areas are also small. The volume of iceberg discharge decreases by 15 percent at a warming of 4 C of the surface temperature, and grows by 3 percent at a temperature fall of 4 C. (Auth. mod.)

F-43455

Raikovskii, IU.V., **Glaciological investigations of the Amery Ice Shelf in 1987-1989** [Gliatsiologicheskii issledovaniia na shel'fovom lednike Eimeri v 1987-1989 gg.], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovanii*, Jan. 1990 Vol.68, p.114, In Russian.

In 1987-1989, members of the Geography Institute (Soviet Academy of Sciences) conducted investigations of the Amery Ice Shelf, which included a study of the sedimentation regime, analysis of the snow-firn cover, temperature measurements and deep boring. Active thawing of the surface layers of the snow mass occurs from the second ten-day period in Nov. to the second ten-day period in Jan. Ten boreholes were made at depths of 10-12 m. 534 ice samples were recovered from the deepest borehole. It appears that the transformation of firn into ice takes place at a depth of 40 m. Temperature measurements were taken up to a depth of 175 m and ranged from -12.5 C at a depth of 18 m to -16.3 C at 75 m.

F-43456

Vinogradov, O.N., Psareva, T.V., **Recent glaciation of antarctic islands** [Sovremennoe oledenenie priantarkticheskikh ostrovov], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovanii*, Jan. 1990 Vol.68, p.117-126, In Russian with English summary. 22 refs.

The results of cartographic work determining the glacierization parameters of antarctic islands situated in the zone of wide-spread icebergs are presented. The paper contains data on the areas of islands proper and the areas of their glacierization, the glacierization extent, ice thickness, and resources in separate marine basins. The area of glaciers makes up 25,566 sq km and the total volume of ice is 5737 cu km of the water equivalent, however this area is about 5 times less than the area of the bodies of similar morphology situated within the ice shelf belt of the continent. Glacier ice is very scarce on the islands in the southern part of the Indian Ocean. The extent of glacierization on the antarctic islands appeared higher than on the polar islands of the Northern Hemisphere, situated in higher latitudes. (Auth. mod.)

F-43457

Korotkov, A.I., Romanov, A.A., **Dynamics of ice conditions in the coastal zone of Antarctica** [Dinamika ledovykh usloviy pribrezhnoy zony Antarktiki], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovaniy*, Jan. 1990 Vol.68, p.126-133, In Russian with English summary. 11 refs.

Stationary polynyas play a very important role in the formation of the ice regime in peripheral antarctic seas. This paper deals with their classification based on the seasonal rhythms of their development, which is a complex process of thermodynamic interaction of the ocean with the atmosphere. The predominance of thermal processes over dynamic processes in the formation of polynyas is described. The dynamics of coastal glaciers are among the important agents in polynya formation. Data on their variations for the last 20 years are presented in the paper. The results are based on satellite observations of the development of 110 stationary polynyas near the coasts of Antarctica. The influence of calving of glaciers on the development of polynyas is shown. (Auth. mod.)

F-43458

Morev, V.A., Manevskii, L.N., Iakovlev, V.M., Zagorodnov, V.S., **Experience in drilling boreholes filled with an ethanol-based antifreeze fluid in Antarctica** [Opyt bureniia skvazhin s zalivkoï antifriznoï zhidkost'iu na osnove etanola v Antarktike], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovaniy*, Jan. 1990 Vol.68, p.181-184, In Russian with English summary. 5 refs.

From 1975 to 1988, 9 deep boreholes were drilled in the ice cover and filled with an ethanol-based antifreeze solution. The solution has a specific weight close to that of ice, prevents ice from flowing into the boreholes, has low viscosity, and is nontoxic. It has been shown experimentally that this antifreeze solution can be used in drilling boreholes in glaciers with temperatures below -57 C. The drilling of a deep borehole on Dome B has been started. (Auth. mod.)

F-43472

Huybrechts, P., **3-D model for the antarctic ice sheet: a sensitivity study on the glacial-interglacial contrast**, *Climate dynamics*, Dec. 1990 5(2), p.79-92, 50 refs.

In this paper, a 3-D time-dependent thermomechanical model for the entire antarctic ice sheet is presented, and is used to examine the effects of glacial-interglacial shifts in environmental boundary conditions on its geometry. The model takes into account a coupled ice shelf, grounding-line dynamics, basal sliding and isostatic bed adjustment, and considers the fully coupled velocity and temperature fields. Ice flow is calculated on a fine mesh for grounded and floating ice and a stress transition zone in between at the grounding line, where all stress components contribute in the effective stress in the flow law. There is free interaction between ice sheet and ice shelf, so that the entire geometry is internally generated. Sensitivity experiments are then performed, in which lower temperatures, reduced accumulation rates and lower global sea level stands are imposed, either singly or in combination. By comparing results of pairs of experiments, the effects of each of these changes can be determined. In agreement with glacial-geological evidence, it is found that the most pronounced changes show up in the West Antarctic ice sheet configuration. They appear to be essentially controlled by variations in eustatic sea level, whereas typical glacial-interglacial changes in temperature and ice deposition rates tend to balance one another. These findings support the hypothesis that the antarctic ice sheet basically follows glacial episodes in the Northern Hemisphere by means of sea-level teleconnections. Grounding occurs more readily in the Weddell Sea than in the Ross Sea and long time scales appear to be involved: it may take up to 40,000 years for these continental shelf areas to become completely grounded after an initial stepwise perturbation in boundary

conditions. According to these reconstructions, a steady state antarctic ice sheet may contribute some 16 m to global sea level lowering at maximum glaciation. (Auth. mod.)

F-43473

Huybrechts, P., Oerlemans, J., **Response of the antarctic ice sheet to future greenhouse warming**, *Climate dynamics*, Dec. 1990 5(2), p.93-102, 25 refs.

This paper deals with the response of the antarctic ice sheet and presents a tentative projection of changes in global sea level for the next few hundred years, due to changes in its surface mass balance. A temperature scenario is imposed in which surface air temperature rises to 4.2 C in the year 2100 AD and is kept constant afterwards. As GCM studies seem to indicate a higher temperature increase in polar latitudes, the response to a more extreme scenario (warming doubled) has also been investigated. The mass balance model, driven by these temperature perturbations, consists of two parts: the accumulation rate is derived from present observed values and is consequently perturbed in proportion to the saturated vapor pressure at the temperature above the inversion layer. The ablation model is based on the degree-day method. It accounts for the daily temperature cycle, uses a different degree-day factor for snow and ice melting and treats refreezing of melt water in a simple way. According to this mass balance model, the amount of accumulation over the entire ice sheet is presently 2,406,000,000,000 cu m of ice, and no runoff takes place. A 1 C uniform warming is then calculated to increase the overall mass balance by an amount of 143,000,000,000 cu m of ice, corresponding to a lowering of global sea level by 0.36 mm/yr. A temperature increase of 5.3 C is needed for the increase in ablation to become more important than the increase in accumulation and the temperature would have to rise by as much as 11.4 C to produce a zero surface mass balance. Imposing the Bellagio-scenario and accumulating changes in mass balance forward in time (static response) would then lower global sea level by 9 cm by 2100 AD. In a subsequent run with a high-resolution 3-D thermomechanical model of the ice sheet, it turns out that the dynamic response of the ice sheet (as compared to the direct effect of the changes in surface mass balance) becomes significant after 100 years or so. Ice-discharge across the grounding-line increases, and eventually leads to grounding-line retreat. This is particularly evident in the extreme case scenario and is important along the Antarctic Peninsula and the overdeepened outlet glaciers along the East Antarctic coast. Grounding-line retreat in the Ross and Ronne-Filchner ice shelves, on the other hand, is small or absent. (Auth. mod.)

F-43482

Morris, E.M., **Turbulent transfer over snow and ice**, *Journal of hydrology*, 1989 Vol.105, p.205-223, Refs. p.221-223.

This paper is a review of the literature on turbulent transfer processes over snow and ice surfaces. Current techniques for modelling these transfers for hydrological purposes are discussed. Literature cited includes studies carried out in Antarctica and the subantarctic islands. (Auth. mod.)

F-43490

Wilson, A.T., Donahue, D.J., **Recovery and dating of carbon dioxide in polar ice cores**, *Radiocarbon*, 1989 31(3), p.579-584, 2 refs.

A new method is described for recovering trapped CO₂ from polar ice cores. The ice is sublimed under vacuum, and H₂O vapor and CO₂ are collected at appropriate cold traps. The application of this method to obtain CO₂ from a specific ice core, the conversion of that CO₂ to graphite, and the measurement of radiocarbon in the CO₂ are described in detail. The potentialities and problems of the method are discussed. (Auth.)

F-43492

Kudriashov, B.B., Iakovlev, A.M., **Drilling in the permafrost**, New Delhi, Amerind Publishing Co., 1990, 318p., 49 refs. For Russian original see 38-1953.

This book presents a brief description of the natural conditions of permafrost regions, properties of the permafrost and the processes occurring in it, fundamentals of the heat transfer processes during drilling, and the service temperature conditions of the tool. Methods and devices for cooling the flushing media, principles of quality control of flushing agents and the technology and commercial viability of their use during drilling in the permafrost have been considered. The main emphasis is on the drilling technology which uses a variety of flushing agents. The text also includes a description of the technology of utilizing grouting solutions, the theory and practice of drilling with simultaneous freezing of weakly cohesive, moist ground as well as drilling holes in the ice-sheets of the circumpolar regions. The final chapter describes the applications of much of this technology by various Soviet Antarctic Expeditions. This book is intended for engineers and technical personnel engaged in drilling for exploratory geological works. (Auth. mod.)

F-43508

Jansen, E., Sjöholm, J., **Reconstruction of glaciation over the past 6 Myr from ice-borne deposits in the Norwegian Sea**, *Nature*, Feb. 14, 1991 349(6310), p.600-603, 36 refs.

It is well known that a significant intensification of Northern Hemisphere glaciation occurred about 2.5 Myr ago, in contrast to the much earlier onset of glaciation in Antarctica. Much less is known about the behavior of the climate before 2.5 Myr, and it has remained unclear when sizeable glaciers first started to develop in the Northern Hemisphere. The history of high-northern-latitude glaciation over the past 6 Myr is deduced from records of ice-borne deposits in deep-sea sediments of the Norwegian Sea. Glaciers large enough to reach sea level were present in the Norwegian Sea area as early as 5.5 Myr, three million years before the intensification of glaciation at 2.5 Myr. Fluctuations in ice volume can be deduced from the oxygen isotope record, but this provides only a global average, which may not reflect the history of ice-sheet growth in specific regions. From a comparison of the oxygen isotope records with the record of ice-rafted material, an estimate is derived of the relative contributions of Southern and Northern Hemisphere glaciation to global variations in the ice volume. Comparisons are made with antarctic data. (Auth.)

F-43509

Staffelbach, T., Neftel, A., Stauffer, B., Jacob, D., **Record of the atmospheric methane sink from formaldehyde in polar ice cores**, *Nature*, Feb. 14, 1991 349(6310), p.603-605, 21 refs.

Measurements of methane from ice cores show that the atmospheric concentration of methane has more than doubled since industrialization, and was only half of the pre-industrial value during the last ice age. Natural sources of atmospheric methane are mainly biogenic, with the main sink for methane being its reaction with OH radicals. This reaction initiates a chain of reactions involving other trace gases and radicals, one of which is formaldehyde. In the remote troposphere, oxidation of methane followed by other reactions is the main source for formaldehyde. By reconstructing records of atmospheric methane and formaldehyde from ice cores, one may examine changes in sources of methane and in the oxidation capacity of the atmosphere.

F-43517

Rapley, C.G., Cudlip, W., Partington, K.C., McIntyre, N.F., Ridley, J.K., **Satellite radar altimetry of ice sheets and ice shelves**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.43-50, 30 refs.

The antarctic and Greenland ice sheets are key elements of the global climate system. Repeated accurate measurements of their surface topography not only provide a fundamental means of investigating their dynamics, but permit the study of possible climate-related changes in their mass balance. Satellite-based radar altimetry is the only practical means of obtaining such data. Here the development of the altimetric measurements of ice sheet and ice shelf topography are reviewed, and new results obtained using data from the Seasat and Geosat instruments are described. These include a comparison of height measurements over a test area in Wilkes Land, which imply an average increase in height of 0.8 m over a 7-year period. The UK is well placed to benefit from the launch of ESA's ERS-1 altimeter in 1990. This will provide coverage to +/- 82 deg for the first time. (Auth.)

F-43560

Bentley, C.R., **Response of the West Antarctic Ice Sheet to CO2-induced climatic warming**, *U.S. Department of Energy. Report*, Apr. 1982 Carbon dioxide effects research and assessment program. Environmental and societal consequences of a possible CO2-induced climate change, Vol.II, Part 1, 32p. DE82 13232.

The paper proposes a research plan to deal with the question of what the response of the West Antarctic Ice Sheet would be to a rise in global temperatures caused by an anthropogenic CO2 buildup in the atmosphere. The plan is designed to answer the following questions: how fast is the ice mass changing now, and why; how will the boundary conditions that affect the ice sheet respond to an atmospheric temperature change and how are those boundary conditions changing now; what will be the response of the ice sheet to changes in boundary conditions; and what can be learned by analogy with what has happened in the past.

F-43561

American Association for the Advancement of Science, **Carbon Dioxide Effects Research and Assessment Program. Environmental and Societal Consequences of a Possible CO2-induced Climate Change: a research agenda**, Washington, D.C, 1980, 122p. DOE/EV/10019-01(V.1).

The major problem to be solved is to understand the nature of the impacts on societies of rising levels of atmospheric CO2 with the objective of avoiding or ameliorating unfavorable impacts and gaining most benefit from favorable impacts. The research program proposed herein is designed to provide the understanding needed to achieve this objective. It is based on a recognition of the distinctive characteristics of the CO2 problem. It is concluded that three kinds of research on the consequences of rising levels of atmospheric carbon dioxide and possible climatic changes are called for: assessment of risks; research to enhance beneficial effects and lessen harmful ones, where this is possible, and to slow down rates of carbon dioxide emission; and study of potential social and institutional responses to projected climatic changes. Recommended research areas of concentration in the category of the cryosphere, oceans, and marine biota are: the future of the ice sheet of West Antarctica; response of Northern Hemisphere sea ice to climatic warming; permafrost changes in Asia and North America; changes in the circulation of the upper ocean; and effects on marine biota. (Auth. mod.)

F-43562

Ackley, S.F., **Potential response of antarctic sea ice to climatic change induced by atmospheric CO₂ increases**, MP 2833, 1981, 17p. + 3p. refs., Contributed paper to the AAAS report to the Department of Energy on Climatic Impact of Increased CO₂ Changes in the Atmosphere. 30 refs.

Possible mechanisms are cited by which antarctic sea ice may affect climate. While many mechanisms can be postulated, consideration must be given to the geologic record, relating to correlation between past climatic changes and sea ice action or response, and the state of knowledge about the present day formation and decay of antarctic sea ice, in order to determine, (1) if sea ice will respond to a CO₂ induced climate warming and (2) how this sea ice change will affect climate. Some aspects of the antarctic sea ice are unique, readily apparent, and should be considered before such a decision is made. They include: (a) the location of the antarctic sea ice on the southern boundary of the Southern Hemisphere westerly wind system, in mid-latitudes, a major repository of kinetic energy of the general circulation of the atmosphere. Ice transport from the Weddell Sea strongly affects mid-latitude temperature and presumably circulation in the S. Atlantic region at the present time. (b) The "free" boundary of the southern sea ice with the world ocean, qualitatively at least, reflects a more interactive role with global scale processes than does the Arctic. (c) The role of the entire region south of the Polar Front as a "heat exchanger," where heat taken up by the ocean elsewhere is dissipated, affecting the total heat transport by the oceans and the ocean-atmosphere interaction in polar regions. (d) As part of the heat exchange process, the formation of antarctic sea ice leads to thermohaline processes producing Antarctic Bottom Water and thereby affects the meridional heat and salt transport by oceanic waters, as well as the global cycling of sea waters for nutrient and gas exchange. (Auth. mod.)

F-43568

Laxon, S., **Seasonal and inter-annual variations in antarctic sea ice extent as mapped by radar altimetry**, *Geophysical research letters*, Sep. 1990 17(10), p.1553-1556, 15 refs.

Previous work has shown that inter-annual variations in total sea ice extent may provide a sensitive indicator of global climate change. Data from passive microwave instruments have allowed mapping of global sea ice extents from 1973-76 and from 1978 up to Sep. 1987. In this paper data from another microwave instrument, the Geosat radar altimeter, have been used to map the antarctic sea ice extent for the period Nov. 1986 to Jan. 1989. Comparison with total antarctic sea ice extents derived from the Scanning Multichannel Microwave Radiometer (SMMR) show excellent agreement during the freeze-up period but show significant differences during the late part of the melt period. (Auth.)

F-43608

Aristarain, A.J., Jouzel, J., Lorius, C., **400 years isotope record of the Antarctic Peninsula climate**, *Geophysical research letters*, Dec. 1990 17(13), p.2369-2372, 32 refs.

A 400 year deuterium record has been obtained from a 154.3 m ice core drilled on Daling Dome, James Ross I. Based on a comparison between the isotope profile and the temperature data over the recent period, an interpretation is proposed in terms of temperature changes. The "warmest part" of this proxy record occurs around 1850 with, as a salient feature, a temperature decline of about 2 C from that time up until present conditions. This feature, at odds with the long timescale warming trend recorded for both hemispheres over the same period, likely reflects a regional characteristic related to the lack of a high latitude/low latitude link in Southern Hemisphere circulation patterns. (Auth.)

F-43635

Legrand, M., **Ice-core record of oceanic emissions of dimethylsulphide during the last climate cycle**, *Nature*, Mar. 14, 1991 350(6314), p.144-146, 19 refs.

The Vostok ice core in Antarctica has provided one of the longest climate records, enabling the stable-isotope, major-ion and gas composition of the atmosphere to be reconstructed over many thousands of years. Presented here are depth profiles along this core of methane-sulphonate and non-seasalt sulphate (produced by the atmospheric oxidation of dimethylsulphide), which provide the first historical record of biogenic sulphur emissions from the Southern Hemisphere oceans over a complete glacial-interglacial cycle (160 kyr). Those measurements confirm and extend some previous observations made on a very limited data set from the Dome C ice core in Antarctica, which indicated increased oceanic emissions of dimethylsulphide during the later stages of the glacial period, compared with the present day. The observed glacial-interglacial variations in methanesulphonate and non-seasalt sulphate confirm that the ocean-atmosphere sulphur cycle is extremely sensitive to climate change. (Auth.)

F-43700

Wang, X., Qin, D., Liu, C., **Stratigraphic studies of the snow and the process of the ice formation on Nelson Ice Cap, Antarctica**, *Antarctic research*, 1990 2(2), p.13-21, In Chinese with English summary. 6 refs.

The Nelson Ice Cap is a polar-maritime glacier. The development of snow and firn depends on wet metamorphic processes from melting water infiltration and freezing. The velocity of snow densification depends on the temperature, the amount of melting water and its physical characteristics. The process of densification appears in the form of homogenization and change. Climatic conditions and amount of melting water also affect the time, depth and shape of ice formation, amounting to 23 to 25 m in 17 to 19 years. Zones of ice formation can be distinguished as warm infiltration-recrystallization, infiltration-congelation and ablation zones. The distribution of these zones is influenced by climatic variations. (Auth.)

F-43701

Ren, J., **Temperature regime of glaciers in the neighbourhood of Great Wall Station, Antarctica**, *Antarctic research*, 1990 2(2), p.22-27, In Chinese with English summary. 6 refs.

Temperature measurements in ice cores drilled in the summer of 1985-1986, in glaciers on Nelson and King George Islands, are discussed. Analysis shows that the temperature at 10 m depth is a little lower than -1 C in the ablation area, and close to 0 C in the accumulation area, except in the central part of King George I., where the elevation is about 680 m and the temperature at 10 m is estimated to be around -5 C. Based on the estimates of temperature distribution in the active layer or the near-surface layer, the temperature regime of the deep layer is discussed qualitatively. It is concluded that the glacier temperature regime in this region is very different from that in the cold glaciers of the higher latitudes, but is not the same as in the temperate glaciers of the lower latitudes. The glaciers in this region are mostly temperate, but at high altitudes, such as in the central part of King George I., the temperature in the active layer is lower due to decrease in air temperature and surface melting with increasing elevation. (Auth. mod.)

F-43717

Khapin, I.U.B., **Study of natural microwave and infrared range emissions from a continental ice sheet, dry snow and sea ice** [Nabliudenie sobstvennogo izlucheniia materikovogo lednika, sukhogo snega i morskogo l'da v mikrovolnovom i IK-diapazonakh], *Gosudarstvennyi nauchno-issledovatel'skii tsentr izucheniia prirodnkh resursov. Trudy*, 1990 Vol.37, p.148-157, In Russian. 16 refs.

Results from experimental investigations of natural emissions from a continental ice sheet, dry snow, sea ice, and fresh ice at wavelengths of 18, 8, 4, 1.5, 0.8, 0.34 cm and in the 8-12 micron range are presented. Some characteristics of their radiation spectra are discussed. Radiothermal characteristics of glaciers in Antarctica and Greenland are included. (Auth. mod.)

F-43726

Tushingham, A.M., **ICE-3G: a new global model of late Pleistocene deglaciation based upon geophysical predictions of post-glacial relative sea level change**, *Journal of geophysical research*, Mar. 10, 1991 96(B3), p.4497-4523, Refs. p.4520-4523.

A new high resolution global model of late Pleistocene deglaciation is inferred on the basis of geophysical predictions of postglacial relative sea level variations in which the ice-ocean-solid Earth interaction is treated in a gravitationally self-consistent fashion. For the purpose of these analyses, the radial viscoelastic structure of the planet is assumed known on the basis of previously published sensitivity tests on solutions of the forward problem. Only radiocarbon controlled relative sea level histories from sites that were actually ice covered (with one or two additions) are employed to confirm its consistency. Here the new deglaciation model, referred to as ICE-3G, is compared to previous models derived by several independent means and tested against a number of additional observations other than sea level histories, including geologically controlled retreat isochrones, oxygen-isotope data from deep-sea sedimentary cores, and coral terrace elevations. The latter two observations strongly constrain the net sea level rise that has occurred since the onset of deglaciation and therefore the mass of ice that melted during the last glacial-interglacial transition. Applications of the model include antarctic deglaciation. (Auth. mod.)

F-43730

Bindschadler, R.A., Vornberger, P.L., **AVHRR imagery reveals antarctic ice dynamics**, *Eos*, June 5, 1990 71(23), p.741-742, 21 refs.

Many of the most significant dynamic features of ice sheets can be identified by a careful examination of AVHRR imagery. The relatively low resolution of this instrument makes it ideal for obtaining a broad view of the ice sheets, while its wide swath allows coverage of areas beyond the reach of high-resolution imagers either currently in orbit or planned. The replacement of high-resolution imagery with AVHRR is not advocated, but rather, the two are viewed as highly complementary. Low-resolution imagery can be effectively used for the initial assessments of the regional dynamics of ice sheets and should be used as guides for choosing the location of more expensive, high-resolution imagery. High-resolution image data will continue to be used for detailed determination of surface velocity and stress fields, mapping, and a host of other applications. With so much of the antarctic continent still poorly mapped, it is likely that there will be more surprises of current and past ice flow resulting from future glaciological investigations. AVHRR imagery, and data from similar instruments such as the 600-m-resolution Defense Meteorological Satellite Program (DMSP) data, can play a significant role in uncovering many of these and should become a more familiar tool of the antarctic scientist. (Auth.)

F-43731

Hill, C., **Is Antarctica breaking apart**, *Australian geographic*, Mar. 22, 1990 344(6264), p.22-23.

An average of 1450 cu km of ice calves from Antarctica annually. In 1986 and 1987, 7 icebergs—ranging from 15 km x 50 km to 95 km x 95 km and amounting to more than 7000 cu km of ice—calved from Antarctica. The equivalent of more than 3 times Antarctica's annual ice accumulation, these calvings raise the concern that something is "upsetting the balance" of the continent.

F-43738

Zwally, H.J., **Breakup of antarctic ice**, *Nature*, Mar. 28, 1991 350(6316), p.274, 9 refs.

This essay provides a brief overview of the observations and discussions which make up the central theme of this issue of *Nature*. Some of the questions are introduced along with a caveat or two about hasty conclusions, the need for thoroughness in investigating viewpoints, and the necessity for recognizing and understanding the relationships between ice, air, and water.

F-43740

Doake, C.S.M., Vaughan, D.G., **Rapid disintegration of the Wordie Ice Shelf in response to atmospheric warming**, *Nature*, Mar. 28, 1991 350(6316), p.328-330, 20 refs.

The breaking up of ice shelves around the Antarctic Peninsula has been cited as a "sign that a dangerous warming is beginning in Antarctica". Satellite images show the disintegration of the Wordie Ice Shelf, which lies off the west coast of the Antarctic Peninsula. Fracture, either in the form of surface crevasses or rifts extending to the bottom of the ice shelf, has been responsible for iceberg calving and weakening the central region of the ice shelf. These fracture processes, which led to retreat of the ice front, were apparently enhanced by the presence of increased amounts of melt water, resulting from a warming trend recorded in mean annual air temperatures in Marguerite Bay. If this warming trend continues, other nearby ice shelves on the Antarctic Peninsula may be at risk. But substantial additional warming would be required before similar processes could initiate breakup of the Ross and Filchner-Ronne ice shelves, which help stabilize the West Antarctic ice sheet. (Auth.)

F-43741

Bindschadler, R.A., Scambos, T.A., **Satellite-image-derived velocity field of an antarctic ice stream**, *Science*, Apr. 12, 1991 252(5003), p.242-246, 24 refs.

The surface velocity of a rapidly moving ice stream has been determined to high accuracy and spatial density with the use of sequential satellite imagery. Variations of ice velocity are spatially related to surface undulations, and transverse velocity variations of up to 30 per cent occur. Such large variations negate the concept of plug flow and call into question earlier mass-balance calculations for this and other ice streams where sparse velocity data were used. The coregistration of images with the use of the topographic undulations of the ice stream, and the measurement of feature displacement with cross-correlation of image windows, provide significant improvements in the use of satellite imagery for ice-flow determination. (Auth.)

F-43746

Zhang, W., Yamanouchi, T., **Surface mass balance and its variability in the Mizuho Plateau, 1987-1988, Antarctic**, *Antarctic research*, 1990 2(3), p.1-10, In Chinese with English summary. 13 refs.

Surface mass accumulation data for the years 1987-1988, including snow distribution and variability of the annual mass balance on Mizuho Plateau, differ greatly from data of previous years. In the region below 550 m a.s.l., which is near the coast, the balance was

negative. Eighty km inland, the annual net mass balance was 0.84 m of snow depth. From that point to Mizuho Station, considered as a low mass balance zone, only 0.14 m of snow depth is reported. It is concluded that the short term climatic and topographic variations had a greater influence on the mass balance in 1987-1988 than in previous years. In the high accumulation zone, the influence of the short term climatic variation is greater than that of the topographic variation, while in the low value zone, the latter is greater than the former. (Auth. mod.)

F-43747

Jia, G., Mao, J., **Morphologic analyses of snow crystals of Antarctica**, *Antarctic research*, 1990 2(3), p.11-17, In Chinese with English summary. 2 refs.

From morphological analyses of 303 snow crystal samples, collected at the Great Wall Station during the 2nd Chinese Antarctic Expedition in Dec. 1985-Jan. 1987, 23 different types are identified.

F-43761

Petit, J.R., White, J.W.C., Young, N.W., Jouzel, J., Korotkevich, Y.S., **Deuterium excess in recent antarctic snow**, *Journal of geophysical research*, Mar. 20, 1991 96(D3), p.5113-5122, 19 refs.

Deuterium excess values in surface snow are presented for central and East Antarctica. The samples are primarily from Soviet, French, and Australian traverses. The d values exhibit a large change going from coastal sites to high-altitude sites on the ice sheet. The d values are relatively constant at 3 to 6 per mill from the coast to an altitude of 2500 m, and at higher elevations d increases steadily to values of 16 to 18 per mill at Vostok and Plateau Station. The data are modeled. Vapor originating from 20-60S was tested with different supersaturation functions. The data could only be fit with moisture originating from 30-40S, indicating that these latitudes are the main source of vapor for snow falling in Antarctica. The model was also tested with moisture simultaneously originating from all latitudes from 30S to the antarctic coast. The addition of up to 20% of moisture evaporated from latitudes south of 50 deg, and 5% from latitudes south of 60 deg, is compatible with low d values occasionally observed in snow near the coast. The conclusion of a "local moisture" effect for coastal and near coastal (<2000 m elevation) snowfall supports a similar conclusion by Saigne and Legrand from their analysis of methanesulphonic acid in antarctic snow. The effects of changes in the sea surface temperature and changes in oceanic humidity on the d values observed in antarctic snow are greatly modified during the precipitation process. Hence the interpretation of d values in ice cores should be done in the context of a precipitation model. (Auth. mod.)

F-43778

Piccardi, G., Udisti, R., Barbolani, E., **Analysis of the principal components of antarctic precipitations**, *Annali di chimica*, 1989 79(11-12), p.701-712, 23 refs.

Some relevant inorganic ions (Na^+ , K^+ , Ca^{2+} , Mg^{2+} , H^+ , SO_4 , SO_2^- , NO_3^- , Cl^-) were determined in snow and ice samples collected during the austral summer of 1987-88. The source of these components may be ascribed to a rich aerosol of marine and crustal origin. Statistical analysis also reveals a contribution of HNO_3 analogous to that found in other parts of the continent. Insoluble impurities play a negligible role. (Auth.)

F-43862

Kudriashov, B.B., Litvinenko, V.S., **High-temperature penetrometer for boring ice and rocks by melting** [Vysokotemperaturnyĭ penetrator dlia bureniia l'dov i gornykh porod plavleniem], *Antarktika; doklady komissii*, 1990 No.29, p.66-73, In Russian with English abstract. 2 refs.

The melting method used in boring deep boreholes in ice is found to be very efficient in antarctic conditions. A high temperature penetrometer, which was developed and tested for the above purpose, is described and illustrated. It is found to be reliable and durable, and can also be used for boring holes by melting in a variety of rocks.

F-43863

Zemtsov, A.A., Mitin, S.V., Shkurko, A.M., **Borehole gas sampler operation control and methods of gas sampling in ice sheets** [Upravlenie rabotoĭ skvazhinnogo gazovogo probotbornika i metodika otbora gazovykh prob iz ledovykh tolshch], *Antarktika; doklady komissii*, 1990 No.29, p.73-79, In Russian with English summary. 5 refs.

Experimental investigations are discussed concerning a borehole gas sampler used at Vostok Station for the determination of absolute age of glacier ice by the radiocarbon method. The apparatus and its operation are described and illustrated.

F-43864

Blinov, K.V., Markov, A.N., **Antarctic ice cover dynamic activity zones in the Vostok Station region** [Zony dinamicheskoi aktivnosti v lednikovom pokrove Antarktidi v raione st. Vostok], *Antarktika; doklady komissii*, 1990 No.29, p.79-89, In Russian with English summary. 16 refs.

The analysis of inclinometric measurements of the deep borehole at Vostok Station, obtained in 1980-1986, made it possible to distinguish several zones varying both in velocity and direction of ice displacement within the thickness of the glacier. The method of distinguishing such zones of abnormal dynamic activity within the ice cover by inclinometric monitoring is proposed. Comparison of the results with the isotope-oxygen analysis data proved their correlation, thus testifying to the connection between the climatic changes and the formation of ice layers with different dynamic qualities. (Auth.)

F-43880

Prentice, M.L., Matthews, R.K., **Tertiary ice sheet dynamics: the snow gun hypothesis**, *Journal of geophysical research*, Apr. 10, 1991 96(B4), p.6811-6827, Refs. p.6825-6827.

Strong negative correlation is noted between Tertiary low- to mid-latitude planktonic foraminiferal delta O-18 and the difference between these data and coeval benthic foraminiferal delta O-18. Late Quaternary data do not show this correlation. Coupling statistical model/delta O-18 comparisons and evidence for antarctic ice and ocean temperature variation, it is inferred that Tertiary ice volume, recorded by tropical planktonic delta O-18, increased as the deep ocean warmed. Because the isotopic signatures of deepwater temperature variation and ice volume change were of opposite sign, the sum of these signals in Tertiary benthic delta O-18 became lost in the noise. This renders low correlation between Tertiary planktonic and benthic delta O-18 time series compared to late Quaternary data. It is contended that Tertiary ice sheet growth was commonly driven by warming of deep water from low- to mid-latitude marginal seas (snow gun hypothesis). In contrast, late Quaternary ice sheets grew as deep water, formed at high latitude, cooled. Because tectonic forcing and orbital forcing at low-latitude primarily controlled production and temperature variations of this Warm Saline Deep Water, these influences largely dictated Tertiary ice volume fluctuations. Through the Tertiary, it is inferred that ice volume fluctuations were an important component of sea level history on timescales between 1,000 and 10,000,000 years. (Auth.)

F-43882

Lingle, C.S., Schilling, D.H., Fastook, J.L., Paterson, W.S.B., Brown, T.J., **Flow band model of the Ross Ice Shelf, Antarctica: response to CO₂-induced climatic warming**, *Journal of geophysical research*, Apr. 10, 1991 96(B4), p.6849-6871, Refs. p.6870-6871.

A time-dependent model is applied to the Ross Ice Shelf flow band discharging ice stream B, West Antarctica. The model includes the effects of temperature, depth-dependent density, and backpressure from the coasts of the Ross embayment and Crary Ice Rise. Data from the Ross Ice Shelf Geophysical and Glaciological Survey and the Siple Coast Project are used as input. Accuracy and stability are verified by reproducing the flow band for 10,000 model years with equilibrium distributions of accumulation, surface temperature, and basal balance. The response of the ice shelf to three climatic scenarios that may result from increasing carbon dioxide and trace greenhouse gases is simulated. The results range from slight thickening with moderately increased backpressure in the grounding zone to rapid thinning accompanied by rapidly decreasing backpressure during 175- to 600-year simulations, depending primarily upon whether increasing surface temperatures and accumulation rates are accompanied by increased rates of basal melting. The central ice shelf, about 400 km upglacier from the calving front, thins by 22% in 600 years when basal melting is increased linearly to a maximum of 0.5 m/yr after 150 years, then holds steady. The ice shelf thins by 40% in 175 years at the same location when basal melting is increased linearly to 2.0 m/yr after 150 years, then holds steady. The present calculated equilibrium rate of basal melting, averaged over the bottom surface of the flow band, is 0.17 m/yr. (Auth. mod.)

F-43886

Squire, V.A., **Sea ice: its formation, distribution and properties**, Polar marine diatoms, edited by L.K. Medlin and J. Priddle, Cambridge, UK, British Antarctic Survey, Natural Environment Research Council, 1990, p.3-8.

At its maximum extent (Sep.) antarctic sea ice covers approximately 20 million sq km, but in Feb., at the end of the austral summer, the ice recedes to its minimum of only 4 million sq km. Implicit in these statistics is a particularly important point, namely that antarctic sea ice is predominantly less than a year old. Whereas some multi-year ice is found in Antarctica, for example in the Western Weddell Sea, the Bellingshausen Sea, the Amundsen Sea and to the east of Ross Ice Shelf, it is in the minority. Although the discussion in this article is directed towards the physical properties of the sea ice itself, it is important to realize that the polar winter plays a crucial role in the development of biological matter due to extended periods of no direct sunlight. (Auth. mod.)

F-43888

Horner, R., **Techniques for sampling sea-ice algae**, Polar marine diatoms, edited by L.K. Medlin and J. Priddle, Cambridge, UK, British Antarctic Survey, Natural Environment Research Council, 1990, p.19-23.

Sampling is one of the most difficult problems in the study of ice algae. Part of the problem is the structure of the ice. In the Antarctic, layers of frazil (platelet) ice crystals may occur between layers of congelation ice, or may form layers up to 4 m deep on the underside of the ice. These variations in the ice structure then may add to the difficulties in choosing an adequate sampling technique for the ice algae. As a result, many techniques have been used, but not all of them have been equally successful or adequately described in the literature. This is an attempt to describe the sampling methods that have been used and to point out some of their strengths and weaknesses. The most commonly used ice sampler has been a surface-operated coring device usually known as a SIPRE corer. Ice samples collected with SIPRE corers have been used to determine primary productivity both in laboratory incubators and *in situ*, and to deter-

mine chlorophyll *a*, species composition, cell numbers, and salinity and nutrient concentration. (Auth. mod.)

F-43900

Piskun, A.A., **Water level and ice melting observations on Beaver Lake** [Nabliudeniia za urovnem vody i taianiem l'da na ozere Biver], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.55-64, In Russian. 8 refs.

Investigations carried out by the 29th Soviet Antarctic Expedition in 1983-1984, concerning the melting rate of snow and ice of the permanently ice-covered Beaver Lake, are discussed. A graph is presented showing the fluctuations of the lake's water level in Dec. 1983 and in Feb. 1984; the tidal harmonic constants are shown in a table. It is suggested that in calculating the water level, it is indispensable to take into consideration the surfacing of the lake's melting ice, which is equal to the amplitude of the tidal waves. A method for the determination of seasonal melting and surfacing of the ice is proposed.

F-43901

Vanda, I.U.A., **Ice condition features in antarctic waters in summer 1986-1987** [Osobennosti ledovykh uslovii v antarkticheskikh vodakh letom 1986/87 g], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.64-71, In Russian. 2 refs.

Ice structural and physico-mechanical properties, and its distribution in various antarctic seas during summer 1986-1987, are summarized. Data include dates, location, name of recording ship, the prevailing conditions for navigation in the area and the optimal times for passage. Maps are presented showing sea ice type and distribution in antarctic coastal waters in the first half of Jan. 1987; ice conditions in the Russkaya Station area on Feb. 8-22, 1987; and the ice conditions of Mar. 3-13 of the same year, during unloading operations of the *Mikhail Somov* in the Somov Sea.

F-43916

Fujii, Y., **Development of the JARE deep ice coring system**, *Antarctic record*, Nov. 1990 34(3), p.303-345, In Japanese with English summary. 12 refs.

A deep ice coring system, which is to be used on the Queen Maud Land ice sheet in 1994-1995 with a plan named "Dome Project", has been developed since 1988. A mechanical system was adopted because of lower power consumption and smaller size compared with a thermal system. Experiments were done for mechanisms of ice cutting, chip transportation, chip storage, antitorque, monitoring sensors, and winch control with a 20 m drill experiment tower. Some experiments were done in Antarctica. This is an interim report of the development of the JARE deep ice coring system. (Auth.)

F-43959

Lange, M.A., Eicken, H., **Sea ice thickness distribution in the northwestern Weddell Sea**, *Journal of geophysical research*, Mar. 15, 1991 96(C3), p.4821-4837, 23 refs.

New data on distribution of snow and sea ice thicknesses in the northwestern Weddell Sea are presented, which were obtained through direct measurements along 19 profiles, each approximately 100 m long on 17 different floes located between 54-46W and 59-64S. The overall probability density functions (PDFs) for ice thicknesses reflect the complex mixture of first-, second-, and multi-year ice to be expected in the outflowing branch of the Weddell Gyre. Further differentiation of the data reveals four distinct thickness classes which represent strongly deformed first year ice, less deformed first- and second-year ice, and deformed second- or multi-year ice, respectively. Each of the classes is characterized by a specific set of quantities related to ice texture and surface snow characteristics, and by distinct

PDFs for snow and ice thicknesses. In addition, geometric surface and bottom roughness characteristics differ significantly for each of the floe classes. (Auth. mod.)

F-43962

Uratsuka, S., Nishio, F., Mae, S., **Radio scattering characteristics of the Roi Baudouin ice shelf, East Antarctica**, International Conference on Ice Technology, 2nd, Cambridge, England, Sep. 18-20, 1990. Proceedings. Edited by T.K.S. Murthy, J.G. Paren, W.M. Sackinger and P. Wadhams, Southampton, England, Computational Mechanics Publications, 1990, p.345-351, 8 refs.

This paper discusses bottom features of the Roi Baudouin ice shelf, East Antarctica, which were revealed by analyzing radio echo sounding data. Smoothness of the ice shelf bottom is inferred from the coherent component of scattering characteristics. Coastal regions have a higher number of smooth bottom features than near continental areas, which suggests that the interaction between sea water and ice shelf bottom is associated with the distance from the grounding line. Furthermore, at the coastal edge of the shelf where echoes from the bottom have strong specular scattering, double trip scattering echoes were observed. This suggests that power losses due to specular scattering are low. (Auth. mod.)

F-43969

Milekhin, O.E., Popov, V.I., Spiridonov, I.U.G., Vol'pian, G.V., **Determining the specific active area of scattering of a probed surface according to data from the Kosmos-1500 satellite side-look radar** [Opredelenie udel'noï effektivnoï ploshchadi rasseianiia zondiruemoï poverkhnosti po dannym RLS BO ISZ tipa "Kosmos-1500"], *Leningrad. Gosudarstvennyi nauchno-issledovatel'skii tsentr izucheniia prirodnkh resursov. Trudy*, 1989 Vol.33, p.104-113, In Russian. 4 refs.

Characteristics of the formation of radar images are reviewed, and a method is described for using the data in the determination of the magnitude of the specific active area of scattering. Some drawbacks of the method are considered. The process is illustrated with graphs of glacier and sea ice profiles and radar images of the Antarctic Peninsula and the Ronne and Filchner Ice Shelves obtained by Kosmos-1500 in Feb. 1986.

F-43970

Bukharov, M.V., Spiridonov, I.U.G., **Characteristics of external calibration of the Kosmos-1500 satellite side-look radar** [Ob osobennostiakh vneshnei kalibrovki RLS BO ISZ tipa "Kosmos-1500"], *Leningrad. Gosudarstvennyi nauchno-issledovatel'skii tsentr izucheniia prirodnkh resursov. Trudy*, 1989 Vol.33, p.114-125, In Russian. 9 refs.

The features of the variability of radar signals specific to the arctic perennial ice and to antarctic ice shelves are analyzed. The conditions are determined in which external calibration of the radar signal requires a supplementary procedure for every measuring session. The relationship is established between highly contrasting radar signals and the different humidity levels of compact, perennial ice during the summer and fall periods.

F-44003

Zwally, H.J., Major, J.A., Brenner, A.C., Bindshadler, R.A., **Ice measurements by GEOSAT radar altimetry**, *Johns Hopkins APL technical digest*, 1987 8(2), p.251-254, 11 refs.

The surface topography of the Greenland and antarctic ice sheets is the principal ice parameter obtainable from satellite radar altimetry.

The improved ability of the GEOSAT altimeter to follow irregular surfaces and its extended operation have greatly increased the available topographic data on ice sheets for the study of ice dynamics and the possible detection of changes in global ice volume. (Auth.)

F-44062

Wadhams, P., **Resource potential of antarctic icebergs**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.203-215, 59 refs.

The possible use of antarctic icebergs as a source of water and electrical power is discussed. The history of the idea, the development of concepts of iceberg use from the 1950s onward, and the physical properties of icebergs which determine their susceptibility to decay and thus their likely survival time under tow, are reviewed. The elements of an iceberg utilization scheme are discussed, including potential destinations, iceberg detection and selection, propulsion, protection, and processing. An "Icetek" scheme which combines water utilization with power generation via ocean thermal energy conversion would seem to offer the best economic prospect for iceberg use, but many technical problems remain unsolved while fundamental physical processes affecting an iceberg tow have yet to be examined experimentally. (Auth.)

F-44079

Orheim, O., Hagen, J.O., Österhus, S., Saetrang, A.C., **Studies on, and underneath, the ice shelf Fimbulisen**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.59-73, 11 refs.

The objective of this NARE 1989/90 program was to measure and understand the processes taking place underneath an ice shelf. Fimbulisen, which is 130 km wide, was selected because it has a size similar to many of the ice shelves around Antarctica, and because it was centrally located. Fimbulisen is the ice shelf continuation of the ice stream Jutulstraumen, which drains an area of 124,000 sq km. It has a discharge of 12.5 cu km/a and flows at about 700 m/a at the grounding line. The main field work of this glaciology group was to drill through the inner part of Fimbulisen, conduct under-ice sampling, and deploy sub-ice instrumentation. Installing the instruments required a hole with a 0.2 m working diameter that could be guaranteed for many hours. Various other glaciologic and oceanographic studies done on the Fimbulisen/Jutulstraumen ice shelf/ice stream system are also described, including ice thickness, bottom saline ice and melt rates, changes of ice shelf thickness, position of grounding line, ice stream lateral boundary, and bed topography.

F-44080

Kennett, M., **Radio-echo investigations in Dronning Maud Land**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.75-79, 8 refs.

Radio-echo measurements have been made during NARE 1989/90 over the Fimbulisen ice-shelf and the Jutulstraumen ice-stream, Dronning Maud Land, using a step-FM radar. The data will be used for information on the ice-sea interaction underneath Fimbulisen, and the conditions at the bed of Jutulstraumen, particularly in the grounding-line region. Both are important in assessing the stability of Dronning Maud Land ice with respect to possible climate changes. Data from a total of approximately 2500 km of helicopter profiles and 50 km of ice surface profiles were collected. Only a small fraction of the data has been analyzed to date, and the results presented here are preliminary. The echo from the bed of Jutulstraumen is certainly weaker than from the shelf bottom, and often difficult to identify in individual shots. The maximum observed ice thickness so far is approximately 800 m. A profile down the center of Jutul-

straumen shows clearly the difference between the smooth shelf bottom echo and the rougher echo from the bed of Jutulstraumen. Bed elevation a few km upstream from the grounding line is quite variable. Within one 6 km section of the profile in particular, bed elevation appears to undergo a series of almost sinusoidal variations of period 1-2 km and amplitude up to 300 m. An example of a radar profile is given.

F-44081

Winther, J.G., **Glaciological and meteorological measurements in Dronning Maud Land, Norsk Polarinstitutt. Meddelelser**, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.81-86, 5 refs.

Interpretation of digital satellite images demand good understanding of the reflective properties of the snow. The reflection of solar radiation from a snow surface is linked to physical properties of the snow (metamorphism) and meteorological conditions (for example the amount, distribution and type of clouds and snowdrift because of wind and the formation of snow dunes). To find the snow albedo during different conditions a broad data base was collected in NARE 1989/90 through measurements of radiation, wind, temperature, humidity, heat transfer and several measurements related to metamorphosis of the snow. A second task of the project was to map the relation between meteorological parameters and the intensity of sublimation/evaporation and snow melt. Estimates of extreme variations in sublimation/evaporation and melting intensity can then be calculated using historical meteorological data. Preliminary snow temperature data at depths of 5 cm and 30 cm and air temperatures at Fimbul Glacier and Troll Station are displayed in graph form on accompanying figures.

F-44082

Corr, H., **Chemical and glaciological studies, Norsk Polarinstitutt. Meddelelser**, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.87-89, 2 refs.

There were three main tasks to perform in this program: obtain accurate surface profiles of specific areas of the ice shelf; collect surface snow samples along a traverse from the ice front; and test and evaluate a ground based impulse radar system. Unfortunately, the pressure transducer failed after only four hours. When repeated attempts to fix the unit failed, the first task was abandoned. In NARE 1989/90, a flagged traverse route was established from the ice front depot at 69.9S, 0.1W to the drill site at 71S, 0.2E, a distance of 120 km. Surface snow samples were collected at regular intervals along the traverse. On a return trip from the depot samples were taken every 4 km, giving a total of 30 sites. At each end of the traverse a shallow pit was dug and samples taken from the walls. All samples were obtained by scraping directly into containers. The transmitting and receiving dipoles for the impulse radar system were resistively loaded with a center frequency of 30 MHz. This makes the received echo from a plane reflector 30 ns long. The received waveform was digitized at 200 MHz in burst mode and stacked before displaying and saving to improve the signal to noise ratio. To cope with the large dynamic range in the received waveform from different reflecting layers within the ice, echos were recorded with different gain settings. At the drill camp a number of short profiles were obtained along the ice flow line. Profiling speed was 15 km/hr, resulting in a completed sounding being recorded every five meters.

F-44129

Bindschadler, R.A., ed, **West Antarctic Ice Sheet Initiative. Volume 1: Science and implementation plan, U.S. National Aeronautics and Space Administration. Conference publication**, Apr. 1991 NASA CP-3115, Vol.1, 53p., 12 refs. Proceedings of a workshop, Greenbelt, MD, Oct. 16-18, 1990.

This report describes the Science and Implementation Plan of the West Antarctic Ice Sheet Initiative (WAIS). The goal of the initiative is the prediction of the future behavior of this ice sheet and an assessment of its potential to collapse, rapidly raising global sea level. The multidisciplinary nature of WAIS reflects the complexity of the polar studies in many fields and meshes with future programs of both the U.S. and other countries. Important tasks in each discipline are described, and a coordinated schedule by which the majority of these tasks can be accomplished in 5 years is presented. (Auth. mod.)

F-44157

Meese, D.A., Govoni, J.W., Churun, V., Ivanov, B., Komarovskii, V., Shilnikov, V., Zachek, A., **Sea ice observations from the Winter Weddell Gyre Study-'89, U.S. Army Cold Regions Research and Engineering Laboratory. Special report**, SR 91-02, Feb. 1991 161p., ADA-236 036, With map notations in Russian.

The data for this report were obtained during the Winter Weddell Gyre Study-'89 from the Soviet icebreaker *Akademik Fedorov*. This study took place between Sep. and Nov. 1989 in the Weddell Sea. Several times each day throughout the cruise, notes were taken on the ice conditions that the ship was passing through at that time. These notes included ice concentration, thickness, ice type, amount of ridging, number of icebergs in the area and other distinguishing characteristics. In addition, photos of the area were taken and are included in the next section. The following section includes detailed ice observations maps. These maps contain information for every mile of ice that was passed through during the cruise, including ice thickness, type and concentration; iceberg size, number and type; and the extent and size of leads. Every 30-60 miles during the cruise stops were made at ice stations where ice cores and water samples were taken for physical and chemical studies, ice thickness grids were drilled, and optical measurements were made. At each site an ice map of the station was compiled, including wind direction and speed, air temperature, ice type, ice thickness and other characteristics of the area. Copies of these maps are found in the *Ice Station Maps* section. Also presented here are daily satellite photos of the area the ship was traversing. Throughout the cruise these photos provided the ship's crew with information regarding ice conditions that the ship would be encountering. The final section consists of weekly ice extent maps of the Weddell Sea obtained from the National Oceanographic and Atmospheric Administration. This report contains a complete observational analysis of the ice conditions encountered during this study in the Weddell Sea. (Auth. mod.)

F-44165

Jezek, K.C., ed, Carsey, F.D., ed, **McMurdo SAR Facility; report of the ad hoc science working team, Ohio State University. Byrd Polar Research Center. BPRC technical report**, 1991 No.91-01, 32p., 37 refs.

It is recommended that a facility be implemented at McMurdo Station to receive synthetic aperture radar (SAR) data in the microwave range from satellites. The facility is designed mainly for the Canadian RADARSAT to be launched in 1994, but should also be able to receive data from the European Remote Sensing Satellite (ERS) in 1991, the Japanese Earth Resources Satellite (J-ERS) in 1992, and the U.S. Earth Observing System (EOS) in 1999, as well as previously launched satellites still functional. Observations of changes in the mass balance of the antarctic ice sheet and sea ice around Antarctica will be used to predict global climate change.

F-44200

Nikitin, P.A., Spiridonov, I.U.G., Trapeznikova, N.B., **Automatic construction of sea ice charts of the Antarctic Ocean from Kosmos 1500 along-track radiometer measurements**, *Soviet journal of remote sensing*, 1987 (Pub. Aug. 1990) 7(5), p.926-936, Translated from *Issledovanie Zemli iz kosmosa*. 12 refs.

A method has been developed to construct schematic maps of the spatial distribution of sea ice in the region of the South Pole, based on along-track microwave radiometer measurements from Kosmos 1500. The paper describes the stages in the processing of the satellite data, gives examples of the automatic construction of schematic maps, and compares the maps with data from other sources. (Auth.)

F-44222

Akademiia nauk SSSR. Mezhdunarodnyy geofizicheskii komitet, **Glaciers-Ocean-Atmosphere Interactions; International Symposium, Leningrad, September 24-29, 1990. Abstracts**, Moscow, MGK AN SSSR, 1990, 131p., 82 abstracts.

This compilation of 82 abstracts of papers includes at least 18 items that deal with Antarctica. The topics range from global changes over the last climatic cycle based on ice core records, to flow mechanics of ice streams, to the dynamics of glaciers.

F-44238

Wadhams, P., Holt, B., **Waves in frazil and pancake ice and their detection in Seasat synthetic aperture radar imagery**, *Journal of geophysical research*, May 15, 1991 96(C5), p.8835-8852, 33 refs.

In this paper, a theoretical model of waves propagating into an ice cover composed of frazil and pancake ice is developed and compared with measurements of wavelength and direction derived from synthetic aperture radar (SAR) imagery. The theoretical model is based on the concept that ice of these types, which consists of small crystals or cakes, has only a mass-loading effect on the water surface. From the reflection coefficient at the ice edge, the wave radiation pressure exerted on the ice is derived, showing that it will cause a slick of frazil ice backed by thicker floes to become more dense or thick with increasing penetration. The implications for radar scattering enabling detection on SAR are that the Bragg resonant wavelength corresponds to waves above the frequency limit for propagation, so that a frazil slick appears dark on an SAR image. When the frazil ice becomes transformed into pancake ice, through slick compression or other means, the raised edges of the pancakes cause the ice to appear bright despite the fact that there are no waves present at the Bragg wavelength. These results are applied to a Seasat SAR image obtained from the Chukchi Sea. The appearance of the ice in the image corresponds to expectations for frazil ice gradually transforming itself into pancake ice, backed by thicker floes. Mean ice thicknesses extracted from the theory correspond to thicknesses expected for such slicks. The technique offers a possible means of extracting the thickness of fields of frazil and pancake ice from SAR imagery; this may be of considerable utility when ERS 1 SAR is used to study the advancing winter ice edge in the Antarctic, which consists of vast areas of these ice types. (Auth. mod.)

F-44273

Enomoto, H., Ohmura, A., **Fluctuations of sea ice extent in the Antarctic**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.58-73, 27 refs.

The sea ice in the Antarctic covers a large area in winter, while most of the ice melts in summer. In this study, characteristics of normal seasonal changes of sea ice area, such as seasonal asymmetric behavior of ice extent and change of sea ice concentration, are investi-

gated using a 12 year-long weekly sea ice data set for the Antarctic. The week-to-week fluctuations of open water areas in the sea ice are large in spring. These open water areas play an important role in the movement of sea ice. Drastic changes are observed at the beginning and end of the freezing period. The characteristic scales in time and space for sea ice movements are obtained from spectral analyses. Some conditions of synoptic scale could be important for the movement of sea ice. (Auth. mod.)

F-44275

Moore, J., Maeno, N., **Application of the dielectric profiling technique to ice core studies**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.81-92, 30 refs.

The dielectric profiling (DEP) technique is described and some of the differences between it and standard electrical tools used in ice core analysis are discussed. The results of DEP analysis on two cores from different regions of Antarctica, Dolleman I. and Mizuho Station, are described. DEP measurements on the Dolleman core are related to the chemical composition of the core, showing that DEP can provide a high accuracy measure of total ionic content of the ice. The measurements on the Mizuho core are compared with earlier dielectric measurements on the same core which show dramatic changes over the 15 year period between the measurements. A mechanism which can explain the changes and other effects noted from d.c. conductivity (ECM) experiments, is suggested. The mechanism is based on the theory of d.c. conduction via liquid acid veins at triple junctions in the ice. (Auth.)

F-44276

Nishio, F., Uratsuka, S., **Subglacial water layer and grounding line derived from backscattering coefficients of radio echo sounding in the Shirase Glacier and Roi Baudouin Ice Shelf, East Antarctica**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.93-102, 10 refs.

In the 1986-87 summer, ice thickness measurements using a newly designed airborne radio echo sounding system were carried out in the Shirase Glacier drainage basin and Roi Baudouin Ice Shelf area. The accurate determination of ice thickness was supported by measurements of surface elevation calibrated over the open sea, at the beginning and end of each flight, with radar altimetry. Location was determined by an OMEGA system and satellite Global Positioning System (GPS). The ice sheet profiles along the flow line of the Shirase Glacier, and the ice shelf along the flight line from Asuka Camp to the Roi Baudouin Ice Shelf, were determined. Bottom features, such as subglacial water layer and grounding line, were clarified by finding the radio backscattering coefficients. The water layer thickness is estimated to be 0-30 cm at the interface between the base of the ice sheet and the bedrock in the regions downstream of Shirase Glacier. (Auth. mod.)

F-44281

Provorkin, A.V., Romanov, A.A., **Satellite information on ice conditions in the southern ocean and its scientific and operational application to navigation** [Informatsiia ISZ o ledovykh usloviakh v IUzhnom okeane i ee ispol'zovanie v nauchno-operativnom obespechenii sudokhodstva], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.114, p.13-16, In Russian.

For better quality information on sea ice distribution at all antarctic automatic ground receiving stations, it is suggested that the reception of radar satellite images be organized so that surveys of all antarctic seas are provided routinely. The stages in the processing of satel-

lite data are described, and examples of the automatic construction of schematic maps are given.

F-44282

Panov, V.V., Romanov, A.A., **Hydrometeorological conditions and characteristics of ship icing in antarctic waters** [Gidrometeorologicheskie usloviia i kharakteristika obledeneniia sudov v antarkticheskikh vodakh], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.17-20, In Russian. 4 refs.

Hydrometeorological conditions are described which threaten navigation in antarctic waters. One of the threats considered in detail is the icing of ships, which endangers their stability. Recommendations for dealing with such a danger include, as an example, the analysis of charts obtained during Dec.-Apr., 1960-1980, which indicate the percentage of probability of slow, fast or very fast icing of ships of various types.

F-44283

Buzuev, A.I.A., Romanov, A.A., **General principles of accounting for ice conditions and estimating ice navigation difficulties** [Obshchie printsipy ucheta ledovykh uslovii i otsenka trudnostei plavaniia sudov vo l'dakh], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.20-25, In Russian.

The formation and development of sea ice, including the dynamics of drifts, fast ice, icebergs and polynyas, and the structural and physico-mechanical properties of antarctic ice are discussed. The effects of prevailing conditions on navigation in the Antarctic are considered, and recommended routes through the frequently travelled runs, optimum speed of ships, best time of the year, etc., are outlined. Also recommended are methods of forecasting ice conditions as part of the planning of supply and relief voyages.

F-44284

Korotkov, A.I., **Regularities of spatial-temporal variability of antarctic stationary polynyas** [Zakonomernosti prostranstvenno-vremmennoi izmenchivosti antarkticheskikh statsionarnykh polynei], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.25-32, In Russian. 8 refs.

Data obtained by the Meteor satellite on the spatial-temporal structure of antarctic polynyas show 122 independent polynyas, 110 of which are stationary. The string of the latter begins to form in the month of Sep., over an area of 0.05 mill. sq. km. reaching its maximum in the month of Jan., when it covers an average of 1.1 mill. sq. km. It begins to disappear at the onset of winter. The main physical and geographic factors responsible for the distribution of polynyas in the Southern Hemisphere are found in the meteorological and oceanographic (especially circulatory) regimes in the antarctic coastal zones. The dynamics of shore ice cover, in relation to the development of polynyas, and the seasonal and interannual variations of the dimensions and occurrence of polynyas, are discussed. Illustrations are provided with a classification of stationary polynyas according to the seasonal regularity of their development, and seasonal variations showing the developmental stages of basic types and subtypes of stationary polynyas.

F-44288

Grigor'ev, I.U.A., Korotkov, A.I., Romanov, A.A., Spichkin, V.A., **Safety measures for operations on antarctic fast ice** [Obespechenie bezopasnosti rabot na antarkticheskom pripe], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.44-51, In Russian. 18 refs.

Considerations regarding the variability of seasonal pack ice dynamics and meteorological conditions which affect the safety of research and cargo operations in the Antarctic are presented. In describing the general characteristics of fast ice, the outlined dangers to ships, particularly in summer and fall, include strand cracks, decreased ice cover thickness, water on offshore ice, breakups at the fast ice edge, and transition from fast ice to drifting ice. The rules to follow to foresee and deal with such dangers are discussed in detail.

F-44291

Romanov, A.A., **Regularities of spatial-temporal variability of antarctic sea ice and navigation conditions** [Zakonomernosti prostranstvenno-vremmennoi izmenchivosti morskikh antarkticheskikh l'dov i usloviia sudokhodstva], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.62-70, In Russian. 10 refs.

Regularities of sea ice distribution, formation, development and decay are discussed. Space and time variations in the distribution area, the volume of drifting ice, location of polynyas, fast ice and ice edge are described in relation to navigation. This covers ice propagation in antarctic waters; mean, maximum and minimum monthly extent of drift ice in the southern ocean; and ice areas during maximum, mean and minimum ice cover development in the Atlantic, Pacific and Balleny regions. Also briefly considered is the interrelationship of atmospheric circulation and ice cover formation.

F-44294

Romanov, A.A., Chepurina, M.A., **Predictability of seasonal ice cover variations in the southern ocean** [K voprosu o predskazuemosti sezonnykh izmenenii ledovitosti IUzhnogo okeana], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.82-86, In Russian. 6 refs.

Various models for statistical study of seasonal and interannual variations of sea ice volume and distribution, based on the division of the southern ocean into 36 sectors of 10 deg. each, are described and shown in tables.

F-44295

Popov, I.K., Pisarevskaiia, L.G., **Fine thermohaline structure of water near antarctic icebergs** [Tonkaia termokhalinnaia struktura vod vblizi antarkticheskikh aisbergov], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.87-92, In Russian. 1 ref.

A study of the fine thermohaline structure of surface water around 5 separate icebergs, occurring under different hydrological conditions, was carried out on the *Akademik Fedorov* during the SAE-33 summer season of 1987-1988. The principal findings are discussed and presented in tables. The interaction between melting icebergs and cold surrounding waters, where the meltwater spreads out in a series of horizontal layers, is explained.

F-44298

Chotin, E., Chotin, P., Hakdaoui, M., Rudant, J.P., **Contribution of SPOT imagery to the study of the nature, texture and structure of ice in Adélie Coast** [Apport de l'imagerie SPOT à l'étude de la nature, texture et structure de la glace en Terre Adélie], *Académie des sciences, Paris. Comptes rendus. Série II*, Apr. 11, 1991 312(8), p.827-834, In French with abridged English version. 7 refs.

The authors applied firstly the standard methods of image treatment on SPOT multispectral and panchromatic images of Adélie

Coast in order to improve their visual quality and discriminate their image facies according to their colors. They then applied an appropriate textural analysis to the panchromatic channels at high resolution, in order to distinguish the different surfaces of the ice according to their texture. The two results were combined for a complete study of the nature and structure of ice in Adélie Coast. (Auth.)

F-44304

Gray, N., Lensu, M., **FINNARP 89 sea ice field report**, *Scott Polar Research Institute. Sea Ice Group. Technical report*, 1990 No.90-03, 26p., 4 refs.

The marine program of the Finnish Antarctic Expedition FINNARP 89, with the Finnish research vessel *Aranda*, from Dec. 1989 through Feb. 1990 in the Weddell Sea, is briefly described. The expedition included observation of ice conditions, measurement of snow depth on the ice, measurement of ice thickness, and aerial photography of the marginal ice zone.

F-44305

Vinogradov, O.N., Psareva, T.V., **Recent glaciation of antarctic islands**, *Polar geography and geology*, Oct.-Dec. 1990 14(4), p.249-260, 22 refs.

For Russian original and abstract see 45-1750 or F-43456.

F-44306

Korotkov, A.I., Romanov, A.A., **Dynamics of ice conditions in the coastal zone of Antarctica**, *Polar geography and geology*, Oct.-Dec. 1990 14(4), p.261-270, 11 refs.

For Russian original and abstract see 45-1751 or F-43457.

F-44313

McKay, C.P., Davis, W.L., **Duration of liquid water habitats on early Mars**, *Icarus*, Apr. 1991 90(2), p.214-221, 45 refs.

A simple climate model of early Mars is employed in order to estimate the duration of ice-covered lakes after the onset of freezing conditions on Mars. The critical parameter determining the existence of ice-covered lakes is the existence of peak seasonal temperatures above freezing. The peak temperature occurs at the subsolar point at perihelion. If there was a source of ice to provide meltwater, liquid water habitats could have been maintained under relatively thin ice covers for up to 700 million years after mean global temperatures fell below the freezing point. At this point, the mean annual temperature is 227 K, and the pressure of atmospheric CO₂ is about 0.5 bar. Without the presence of stable bodies of liquid water, it is not clear what mechanisms were responsible for the removal of this remaining CO₂. From a biological point of view, it is found that the duration of liquid water habitats on early Mars exceeds the upper limit on the time required for the origin of life on Earth. In modeling such lakes, experimental data derived from the investigation of dry valley lakes in Antarctica is utilized. (Auth. mod.)

F-44323

Piccardi, G., Udisti, R., Bellandi, S., Barbolani, E., **Characterization of snow in the area surrounding Terra Nova Bay (Antarctica)**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.55-61, 6 refs.

Snow samples collected during the antarctic summer Italian expedition of 1987/88 and 1988/89 are analyzed for the determination of the main and some trace components. The study of the composition of antarctic atmospheric precipitation is easily carried out by analyzing

snow samples collected on the continent. The aim is to identify the various contributions to the aerosol composition: atmospheric, marine and crustal. The distance from great sources of unnatural pollutants limits their contribution and thereby allows a better characterization of different local situations. (Auth. mod.)

F-44346

Han, M.W., Yoon, H.I., **Effect of sea salts in the major anion distribution in an ice core of the Fildes Peninsula ice field: a preliminary study result**, *Korean journal of polar research*, Dec. 1990 1(2), p.17-23, In Korean with English summary. 11 refs.

Preliminary results are reported from anion analyses (sulfate, chloride, nitrate) of a 2 m ice core from the Fildes Peninsula ice field on King George I. The sulfate and chloride data are characterized as follows: concentrations of sulfate and chloride in the ice core are 30 to 40 times higher than those reported from a South Pole ice core. The characteristics of sulfate and chloride strongly suggest that the Fildes Peninsula ice field is under the direct influence of sea salts originating from the surrounding seas: Drake Passage and Maxwell Bay. The influence of sea salts in the ice is further substantiated by the fact that strong winds are very common in the area due to frequent marine cyclones. (Auth. mod.)

F-44353

Bindschadler, R.A., ed, **West Antarctic Ice Sheet Initiative. Discipline reviews**, *U.S. National Aeronautics and Space Administration. Scientific and Technical Information Program. NASA conference publication*, May 1991 2(3115), 143p., Proceedings of the workshop held at Goddard Space Flight Center, Greenbelt, MD, Oct. 16-18, 1990. Refs. passim. For individual papers see 43-3164 or F17-39661, and F-44354 through F-44359 or 45-3278 through 45-3283.

This report contains seven discipline review papers on the state of our knowledge of West Antarctica and opinions on how that knowledge must be increased to predict the future behavior of this ice sheet, and to assess its potential for collapse, rapidly raising global sea level. The papers were prepared to accompany lectures given at the second SeaRISE workshop. The purpose of the workshop was to draft a Science and Implementation Plan of what was once called SeaRISE but is now called the West Antarctic Ice Sheet Initiative (WAIS). The plan appears as Vol.1 of this proceedings series. (Auth. mod.)

F-44354

Bromwich, D.H., Carleton, A.M., Parish, T.R., **Review of precipitation-related aspects of west antarctic meteorology**, *U.S. National Aeronautics and Space Administration. Scientific and Technical Information Program. NASA conference publication*, May 1991 2(3115), p.1-22, Refs. p.10-15.

An overview is presented of the factors associated with snowfall over the West Antarctic Ice Sheet. The flux of atmospheric moisture across the coast, the synoptic processes over the South Pacific Ocean, the large-scale atmospheric controls, and numerical modeling of the west antarctic environment are all discussed. Suggestions are made for research needed to substantially upgrade the status of knowledge in these closely-interrelated topic areas. (Auth.)

F-44355

Jacobs, S.S., **Sea-level response to ice sheet evolution: an ocean perspective**, *U.S. National Aeronautics and Space Administration. Scientific and Technical Information Program. NASA conference publication*, May 1991 2(3115), p.23-47, Refs. p.35-39.

The ocean's influence upon and response to antarctic ice sheet changes is considered in relation to sea level rise over recent and future decades. Assuming present-day ice fronts are in approximate equilibrium, a preliminary budget for the ice sheet is estimated from accumulation vs. iceberg calving and the basal melting that occurs beneath floating ice shelves. Iceberg calving is derived from the volume of large bergs identified and tracked by the Navy/NOAA Joint Ice Center and from shipboard observations. Basal melting exceeds 600 cu km/yr and is concentrated near the ice fronts and ice shelf grounding lines. An apparent negative mass balance for the antarctic ice sheet may result from an anomalous calving rate during the past decade, but there are large uncertainties associated with all components of the ice budget. The results from general circulation models are noted in the context of projected precipitation increases and ocean temperature changes on and near the continent. (Auth. mod.)

F-44356

Bentley, C.R., **Terrestrial geophysics in the SeaRISE Project**, *U.S. National Aeronautics and Space Administration. Scientific and Technical Information Program. NASA conference publication*, May 1991 2(3115), p.49-54.

The multiple purposes of radar sounding, in addition to mapping ice thickness and the surface and bedrock topography of the ice sheet—and its specific applications to the problems of the grounded and floating parts of the West Antarctic Ice Sheet—are described. Also considered from the same point of interest are seismic shooting, passive seismic studies, electrical resistivity, and gravity.

F-44357

Anderson, J.B., **Marine record of Late Quaternary glacial-interglacial fluctuations in the Ross Sea and evidence for rapid, episodic sea level change due to marine ice sheet collapse**, *U.S. National Aeronautics and Space Administration. Scientific and Technical Information Program. NASA conference publication*, May 1991 2(3115), p.87-100, Refs. p.107-110.

Some of the questions to be addressed by SeaRISE include: what was the configuration of the West Antarctic Ice Sheet during the last glacial maximum; what is its configuration during a glacial minimum; and has it, or any marine ice sheet, undergone episodic rapid mass wasting? This paper addresses these question in terms of what is known about the history of the marine ice sheet, specifically in the Ross Sea, and what further studies are required to resolve these problems. A second question concerns the extent to which disintegration of marine ice sheets may result in rises in sea level that are episodic in nature and extremely rapid. Evidence that rapid, episodic sea-level changes occurred during the Holocene is also reviewed. (Auth. mod.)

F-44358

Alley, R.B., **Ice cores and SeaRISE—what we do (and don't) know**, *U.S. National Aeronautics and Space Administration. Scientific and Technical Information Program. NASA conference publication*, May 1991 2(3115), p.111-130, Refs. p.123-127.

Ice-core analyses are needed in SeaRISE to learn what the West Antarctic Ice Sheet and other marine ice sheets were like in the past, what climate changes led to their present states, and how they behave. The major results of interest to SeaRISE from previous ice-core analyses in West Antarctica are that the end of the last ice age caused temperature and accumulation-rate increases in inland regions, leading to ice-sheet thickening followed by thinning to the present. (Auth.)

F-44359

Whillans, I., **Glacial dynamics (glaciology)**, *U.S. National Aeronautics and Space Administration. Scientific and Technical Information Program. NASA conference publication*, May 1991 2(3115), p.131-143.

This report reviews recent results from studies of ice dynamics that relate to the objectives of the WAIS initiative. The best evidence shows that the ice sheet in West Antarctica is the most rapidly changing ice sheet on earth today. Its rate of change is much faster than most glaciologists had expected, and it is changing in a manner much more complex than foreseen. The changes have two broad causes: a delayed but ongoing response to the termination of the last glaciation about 10,000 years ago, and automatic, internally-caused flow adjustments. The flow styles are listed in order of slowest to fastest speed.

F-44360

Arrigo, K.R., Sullivan, C.W., Kremer, J.N., **Bio-optical model of antarctic sea ice**, *Journal of geophysical research*, June 15, 1991 96(C6), p.10,581-10,592, 47 refs.

Biogenic particulate material in sea ice can substantially influence the spectral irradiance within the ice sheet and underlying seawater. In order to simulate accurately seasonal changes in light conditions *in situ*, the biomass changes of the sea ice microbial community must be considered. This paper attempts to provide an improved description of the optical regime within sea ice by combining information provided by models of radiative transfer in sea ice and snow and models of solar spectral irradiance with formulations describing the attenuation of spectral irradiance by particulates observed in sea ice in McMurdo Sound. Emphasis has been placed on the role of biogenic particles in visible light attenuation with the intent of developing a bio-optical model that more rigorously describes their influence on radiative transfer processes as they occur in nature. Model results simulating seasonal changes in both photosynthetically active radiation and its spectral distribution agree well with measured under-ice spectral irradiance. Results reveal how changes in microalgal concentrations, as well as their photophysiological characteristics, influence both the quantity and quality of downwelled light in sea ice and in the upper layers of the ice-covered oceans. (Auth. mod.)

F-44361

Eicken, H., Lange, M.A., Dieckmann, G.S., **Spatial variability of sea-ice properties in the northwestern Weddell Sea**, *Journal of geophysical research*, June 15, 1991 96(C6), p.10,603-10,615, 38 refs.

Arrays of sea-ice cores were taken from three floes in the northwestern Weddell Sea. Texture, salinity, chlorophyll *a*, and nutrient concentrations were determined in order to study the small-scale variability of these properties. Their vertical distribution patterns are similar among core samples from a specific floe. Mean salinity exhibits generally low standard deviations between cores. At specific depth levels, very high differences may occur, such as maximum salinity differences of more than 10 ppt at the top of floes. Mean chlorophyll concentrations vary up to one order of magnitude on small scales, which is as high as the regional variability exhibited by cores from the entire study area. Excepting ammonium, concentrations of nutrients vary much less than chlorophyll. Individual profiles and variability of nutrients are tied to chlorophyll concentrations. The variability of salinity and chlorophyll seem linked to the distribution of large-scale secondary pores within the ice. (Auth. mod.)

F-44408

Fujita, S., Ikeda, N., Azuma, N., Hondoh, T., Mae, S., **Numerical estimation of 10,000 years later equilibrium ice sheet profile in the Shirase Glacier drainage basin, East Antarctica**, *Antarctic record*, Mar. 1991 35(1), p.12-29, 22 refs.

Recent observations show that the ice sheet in the Shirase Glacier drainage basin is thinning. If the observed thinning is assumed to be a transitional process in which the ice sheet is adjusting to the present climate, an equilibrium ice sheet profile which adjusts to the present climate would provide information for understanding the present behavior of the ice sheet. The equilibrium ice sheet profile was estimated by using a three-dimensional non-steady state ice sheet model. Results of the calculation showed that an almost stationary state of the ice sheet was achieved after 10,000 model years when started from the present profile of the ice sheet. The equilibrium ice sheet profile depended on bedrock topography and tested parameters sensitively, but the calculations indicated that ice thickness tends to decrease in the middle-stream region in general. It was also revealed that the ice sheet in the vicinity of the Yamato Mountains was relatively stable even if the parameters were changed. (Auth. mod.)

F-44410

Ageta, Y., Kamiyama, K., Narita, H., Satow, K., **Oxygen isotope profiles of deposited snow in different depositional environments of the antarctic ice sheet**, *Antarctic record*, Mar. 1991 35(1), p.39-46, In Japanese with English summary. 9 refs.

Vertical profiles of oxygen isotopic contents in deposited snow were obtained in the region where katabatic winds prevail: Mizuho Station, the inland dome-like plateau, and the transitional zone between them. At Mizuho Station, the $\delta O-18$ contents have high values around the hiatus layers. However, synchronous relations cannot be found between the neighboring profiles, since snow was exchanged due to deposition and erosion by strong winds. Inter-annual variations of oxygen isotopic contents in snow have been preserved best in the inner parts of the ice sheet. The profile at the plateau has good correlation with the inter-annual variation of summer temperature at 5000 gpm above the South Pole. This result suggests that the temperature at this level above the South Pole is representative of air temperature conditions over the inland ice sheet, and the meteorological conditions in summer have a strong effect on the transition of the oxygen isotopic content of snow after deposition due to evaporation-sublimation. (Auth. mod.)

F-44432

Squyres, S.W., Andersen, D.W., Nedell, S.S., Wharton, R.A., Jr., **Lake Hoare, Antarctica: sedimentation through a thick perennial ice cover**, *Sedimentology*, Apr. 1991 38(2), p.363-379, Refs. p.378-379.

Lake Hoare in the Dry Valleys of Antarctica is covered with a perennial ice cover more than 3 m thick, yet there is a complex record of sedimentation and of growth of microbial mats on the lake bottom. Rough topography on the ice covering the lake surface traps sand that is transported by the wind. In late summer, vertical conduits form by melting and fracturing, making the ice permeable to both liquid water and gases. Cross-sections of the ice cover show that sand is able to penetrate into and apparently through it by descending through these conduits. This is the primary sedimentation mechanism in the lake. Sediment traps retrieved from the lake bottom indicate the rates of deposition can vary by large amounts over lateral scales as small as 1 m. In some locations on the lake bottom, distinctive sand mounds have been formed by this process. They are primary sedimentary structures and appear unique to the perennially ice-covered lacustrine environment. Rapid colonization and stabilization of fresh sand surfaces by microbial mats composed of cyanobacteria, eukaryotic algae, and heterotrophic bacteria produces a complex intercalation of organic and sandy layers that are a distinctive form of modern stromatolites. (Auth. mod.)

F-44441

Determann, J., **Numerical modelling of ice shelf dynamics**, *Antarctic science*, June 1991 3(2), p.187-195, 31 refs.

By considering the basic stress equations for a unit volume of ice, the author derives a set of differential equations describing ice shelf flow. In view of the lack of basal shear stresses at the bottom of ice shelf, a model simulation which is restricted to the horizontal dimensions will not imply substantial errors. The model is applied to the Filchner-Ronne Ice Shelf, and model equations are solved in terms of finite differences on a 10 x 10 km grid. Present ice thickness data and boundary conditions, i.e. the balance velocities at the grounding line and strain rates at the ice front, are entered as input. Using a non-linear Glen-type flow law ($n=3$) and a constant depth-averaged flow law parameter, representing an ice temperature of -17 C, a convincing velocity field is derived as a solution of the model equations. The model takes into account restrained flow across ice rumpled where sufficient field data are available. A diagnostic run reproducing present velocity magnitudes is followed by two prognostic runs, each representing 2000 years of simulation. Transient ice thickness changes are obtained from solving the mass conservation equation. (Auth. mod.)

F-44461

Scofield, J.P., Fastook, J.L., Hughes, T.J., **Evidence for a frozen bed, Byrd Glacier, Antarctica**, *Journal of geophysical research*, July 10, 1991 96(B7), p.11,649-11,655, 24 refs.

Ice thickness, computed within the fjord region of Byrd Glacier on the assumptions that Byrd Glacier is in mass-balance equilibrium and that ice velocity is entirely due to basal sliding, is on average 400 m less than measured ice thicknesses along a radio-echo profile. In this paper, four explanations for these differences are considered: (1) active glacier ice is separated from a zone of stagnant ice near the base of the glacier by a shear zone at depth; (2) basal melting rates are some 8 m/yr; (3) internal shear occurs with no basal sliding in much of the region above the grounding zone; or (4) internal creep and basal sliding contribute to the flow velocity in varying proportions above the grounding zone. Large gradients of surface strain rate seem to invalidate the first explanation. Computed values of basal shear stress (140 to 200 kPa) provide insufficient frictional heat to melt the ice as demanded by the second explanation. Both the third and fourth explanations were examined by making simplifying assumptions that prevent a truly quantitative evaluation of their merit. Nevertheless, there is no escaping the qualitative conclusion that internal shear contributes strongly to surface velocities measured on Byrd Glacier, as is postulated in both these explanations. (Auth. mod.)

F-44464

Budd, W.F., **Antarctica and global change**, *Climatic change*, Apr. 1991 18(2-3), p.271-299, Refs. p.296-299.

Changes in the mass balance of the antarctic ice sheet impact on global sea level. A unique historic record of past climate and global environmental changes is being obtained from deep core drilling in the antarctic ice sheet. Decreases of stratospheric ozone are most pronounced over the Antarctic in spring. The impact of increases in ultraviolet radiation on the biosphere can be studied in the Antarctic as a precursor to possible changes developing elsewhere around the globe. Changes in the atmosphere and ocean circulations resulting from the decrease in antarctic sea ice cover can have important effects on ocean surface temperatures, which impact on the climates of the continents. These topics are discussed briefly and a number of antarctic research areas are highlighted which build on existing or planned international programs and which can make critical contributions to multidisciplinary studies of global change. (Auth. mod.)

F-44475

Gloersen, P., Campbell, W.J., **Recent variations in arctic and antarctic sea-ice covers**, *Nature*, July 4, 1991 352(6330), p.33-36, 23 refs.

Variations in the extents of sea-ice cover at the poles and the areas of open water enclosed within them were observed every other day

during the interval 1978-1987 by a satellite-borne scanning multispectral microwave radiometer. A band-limited regression technique shows that the trends in coverage of the arctic and antarctic sea-ice packs are not the same. During these nine years, there are significant decreases in ice extent and open-water areas within the ice cover in the Arctic, whereas in the Antarctic there are no significant trends. (Auth.)

F-44478

Kipfstuhl, J., **On the formation of underwater ice and the growth and energy budget of the sea ice in Atka Bay, Antarctica** [Zur Entstehung von Unterwassereis und das Wachstum und die Energiebilanz des Meereises in der Atka Bucht, Antarktis], *Berichte zur Polarforschung*, 1991 No.85, 88p., In German with English summary. Refs. p.82-88.

In Atka Bay the sea ice grows into a spongy layer of loose ice platelets up to 15 cm in diameter and 2-3 mm thick so-called underwater ice. In 1982 the solid sea ice and the sub-ice platelet layer, 2 m and 4 m thick respectively, represented a total ice column of 3 to 4 m, whereas in the Weddell Sea the average thickness of the sea ice is less than 1 m. This thesis investigates the formation of underwater ice and its importance for the growth and surface heat budget of the sea ice in Atka Bay. The Maykut-Untersteiner model of sea ice combined with meteorological data of the Georg von Neumayer Station was used to calculate the growth and surface heat budget of the sea ice in Atka Bay. For the latter the existence of the sub-ice platelet layer is of minor importance. Only about half of the observed solid ice growth can be explained by heat loss of the ocean to the atmosphere. The model yields good agreement with the observed sea ice growth when using a fraction of 20% of ice within the sub-ice platelet layer. A comparison of the surface heat budgets of the sea ice of Atka Bay with ice in the central Arctic shows that the high surface ablation observed in the Arctic seems to originate from a significantly higher radiative energy gain during the ablation season in the Arctic. (Auth. mod.)

F-44479

Determann, J., **Flow of ice shelves—numerical simulations using the finite-difference method** [Das Fließen von Schelfeisen—numerische Simulationen mit der Methode der finiten Differenzen], *Berichte zur Polarforschung*, 1991 No.83, 82p., In German with English summary. 78 refs.

This thesis addresses the dynamics of ice shelves and their sensitivity to changing mass-balance quantities. Using the flow law for ice, a set of differential equations describing ice-shelf flow is developed. The calculated velocity field is improved locally by defining a retarding mechanism which simulates basal friction. Being able to reproduce the observed flow of the Filchner-Ronne Ice Shelf, the model is used to simulate transient ice-shelf dynamics. This implies solving the mass-conservation equation, involving accumulation rates and ablation rates from the ice-shelf surface and bottom. By means of the simulated present-day flow field, accumulation rates at the ice-shelf bottom in excess of 2 m/a are derived for a locally limited area. Prognostic studies comprising hypothetical distributions of accumulation and melting reveal that the ice-shelf thickness profile strongly depends on interactions with the ocean. In order to investigate how steady-state profiles influence the grounding line position, the ice-shelf model is expanded by a flow model for the ice sheet. Due to lack of data, the coupled model is merely applied to a synthetic ice sheet-ice shelf system. For defined mass fluxes and a given sea-bottom topography the evolution of each component can then be followed. For the first time, the flow of Ekström Ice Shelf is simulated but, because the mass-balance is not known, prognostic calculations have not been performed. If mass balance and bottom topography should be recorded by future expeditions, the coupled model, when applied to the Ekström Ice Shelf, will reveal new findings on the dynamics of large ice masses.

F-44480

Eicken, H., **Quantification of sea-ice properties: automated image analysis of thin sections and parametrization of chlorophyll and salinity distributions** [Quantifizierung von Meereiseigenschaften: Automatische Bildanalyse von Dünnschnitten und Parametrisierung von Chlorophyll- und Salzgehaltsverteilungen], *Berichte zur Polarforschung*, 1991 No.82, 105p., In German with English summary. Refs. p.98-105.

The aim of this paper is to (1) quantify sea-ice texture, (2) parametrize vertical profiles of important sea-ice properties, (3) develop methods for automated determination of these quantifiers, and (4) test the methods with representative data sets. This paper represents an attempt to use automated digital image-processing techniques for studies of sea-ice texture, allowing for rapid quantitative and reproducible textural evaluation. For approximately 100 sea-ice cores from the central Arctic, Fram Strait and the Weddell Sea, stratigraphy, salinity, and chlorophyll concentrations have been determined. The first part describes the digitization of approximately 120 thin sections with a video camera and a simple microcomputer-based image-processing board along with methods of textural quantification through project software developments. Images have been recorded between crossed polarizers, in circularly polarized light, and in plain and diffuse light. Section 3 is aimed at parametrizing vertical profiles of salinity and chlorophyll concentration through polynomial curve fitting. This method allows for direct comparison of samples from different regions or between different ice properties and the growth history of a floe. Evaluating the regional distribution of textural and profile parameters determined in this study shows that variations of these parameters are closely linked to differences in the specific regimes of ice formation, growth and metamorphosis. (Auth. mod.)

F-44515

Aver'ianov, V.G., **Glacio-climatology of Antarctica** [Gliatsioklimatologiya Antarktidy], Leningrad, Gidrometeoizdat, 1990, 198p., In Russian. Refs. p.180-198.

The interrelationship between antarctic ice cover and surface meteorological conditions, and the antarctic climate as a whole, are investigated. The 1st chapter of the book deals with the morphology of the ice cover, the 2nd, with its climate, including atmospheric temperature and circulation, precipitation, humidity and climatic zonation. Ch. 3 examines conditions for the formation of the cover's active layer, including the structure and properties of its snow cover, such as snow ablation, accumulation, and melting rates. A glacio-climatological zonation is included in this chapter. The 4th and final chapter presents a quantitative analysis of mean annual values of the ice cover surface balance, including water and moisture balance of the atmosphere, and radiation and heat balance. The structure of the mass energy balance is analyzed, leading to concluding remarks on the stability and the state of equilibrium of the contemporary antarctic glaciation.

F-44517

Etheridge, D.M., **Scientific plan for deep ice drilling on Law Dome, Australian National Antarctic Research Expeditions**. *ANARE research notes*, Sep. 1990 No.76, 41p., Refs. p.39-41.

The Australian Antarctic division will undertake a deep drilling program in the summer seasons 1989-90, 1990-91 and 1991-92 near the summit of Law Dome to extract a 1240 m ice core using an electromechanical drill in a fluid-filled borehole. The report outlines the types of records it is intended to obtain from analysis of the core and surveys of the borehole, their potential applications and scientific justification. The recommended ice core analysis plan suggests the type and frequency of sampling required for the different parameters

and describes the types of measurements and observations that will be made. The interrelation and interdependence of the various measurements is discussed. An outline of the logistic support required for the efficient running of the field program is included. (Auth. mod.)

F-44525

Zakharov, V.F., **Sea ice and climate, Polar geography and geology**, Apr.-June 1990 14(2), Interaction of sea ice, snow, and glaciers with the atmosphere and ocean, Part 2. Edited by V.M. Kotliakov and M.G. Grosswald, p.75-99, For Russian original see 42-2850 or 16F-37313. For Parts 1 and 3 of this translation see 45-1261 and 45-2409, respectively.

Formation of sea ice in both hemispheres is discussed. The antarctic glacial situation compared to the Arctic Ocean and physical causes of sea ice impact on climatic conditions, resulting in major changes, are argued and illustrated with meteorological, oceanographic, and glaciological data.

F-44541

Stäblein, G., **Polar ice and iceberg use: potential for water supply** [Polareis und Eisbergnutzung: Potential zur Wasserversorgung], *Geographische Rundschau*, June 1991 43(6), p.348-354, In German. 26 refs.

Since about 80% of the Earth's fresh water is locked in polar ice sheets and icebergs, it would seem that these resources could provide substantial water amounts to drought areas if means could be found to transport the water from where it is and release it where it is needed. Considering both arctic and antarctic ice covers, various aspects of this concept are explored: how large is the resource; what are the seasonal maxima and minima; how much is from sea ice, how much from icebergs; what transport technology is available; what distances are involved and how will ocean currents aid or hinder; what water temperatures will be encountered; what are the costs and what history does this concept have.

F-44545

Lange, M.A., **Properties of sea ice in the Weddell Sea, Antarctica**, IAHR Symposium on Ice, 10th, Espoo, Finland, Aug. 20-23, 1990. Proceedings, Vol.1, [1990], p.289-299, 12 refs.

Major properties of antarctic sea ice as seen during a number of expeditions to the Weddell Sea are summarized. Investigations are concentrated on the assessment of ice texture and its relation to physical, chemical and biological properties of sea ice. The textural distribution of antarctic sea ice is dominated by granular ice of frazil origin. This is a consequence of the main processes of ice formation in the advancing ice edge, the "pancake cycle". Ice thicknesses of undeformed and deformed first year ice lie between 0.4 to 0.8 m and 0.8 to 1.1 m, respectively. In the near absence of congelation growth at the ice-water interface, formation of snow ice and the incorporation of meteoric ice into sea ice floes become significant processes. (Auth. mod.)

F-44546

Lensu, M., **Fractality of sea ice cover**, IAHR Symposium on Ice, 10th, Espoo, Finland, Aug. 20-23, 1990. Proceedings, Vol.1, [1990], p.300-313, 9 refs.

Because of the self-similar appearance of pack ice fields it has been frequently suggested that fractal geometry would provide a powerful tool in the analysis of floe geometry. Here the box-counting fractal dimension is calculated for antarctic summer pack ice and a value of 1.56 is found. This dimension is valid for all scales. The fractality of fragmentation processes has usually been studied by considering the size distribution; it should obey a power law. Here the power law is found to be valid for small floes only. (Auth.)

F-44548

Duthinh, D., **Full scale iceberg impact: a pilot experiment in Antarctica**, IAHR Symposium on Ice, 10th, Espoo, Finland, Aug. 20-23, 1990. Proceedings, Vol.2, [1990], p.890-901, 7 refs.

At the French antarctic station Dumont d'Urville, a 1700 tonne iceberg was towed by a bulldozer into a rock face in 13 m water depth. The impact occurred at a velocity of 0.89 m/s and lasted 2.25 seconds. The impact force was estimated to be between 4.5 and 6.5 MN, the contact area between 1.8 and 3.6 sq m and the impact pressure between 1.3 and 3.6 MPa. This research is pertinent to design criteria for fixed man-made structures, such as runways, which may extend into iceberg infested waters. (Auth. mod.)

F-44549

Granberg, H.B., Leppäranta, M., **Helicopterborne remote sensing of antarctic sea ice using a laser profiler, synchronized video and 70 mm camera during FINNARP-89**, IAHR Symposium on Ice, 10th, Espoo, Finland, Aug. 20-23, 1990. Proceedings, Vol.3, [1990], p.313-325, 9 refs.

A PRAM IV laser profiling system, a video camera and a Hasselblad 70 mm camera were used to study ice conditions near the ice margin in the eastern Weddell Sea, Antarctica. The sensor combination offers some interesting analytical possibilities. Digital elevation models of the ice surface, and ice block, ridging and other statistics may be produced without need for supporting ground surveys. The field work was carried out between Dec. 29, 1989 and Jan. 5, 1990 and the data thus represent the time of year when most shipping activity takes place in this region. This paper describes the techniques used in the data acquisition, outlines the analytical procedures and presents some preliminary results. These preliminary results indicate that ridge size and frequency are greater in the Weddell Sea than in the Ross Sea. (Auth.)

F-44550

Wait, J.R., **Diffraction of VLF radio waves by polar ice caps**, *Electronics letters*, June 6, 1991 27(12), p.1030-1032, 11 refs.

In this paper, a rudimentary theory is outlined for the phenomenon of diffraction of long radio waves by continental land masses for long seawater paths. The results would seem to be particularly relevant to observations for a path that just grazes the coast of Antarctica. (Auth. mod.)

F-44554

Reid, D.E., Anderson, J.B., **Hazards to antarctic exploration and production**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.31-45, 63 refs.

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Antarctica's continental shelf averages 500 m in depth and exhibits a landward slope, due to the combined effects of isostatic loading and glacial erosion. These effects are more pronounced near the continent. The highly rugged topography of the shelf typifies high latitude continental shelves. Antarctica is the coldest, driest, windiest place on earth and the extremely hostile climate represents a formidable obstacle to the exploration for hydrocarbons. Sea ice covers the entire continental shelf during most of the year and presents another serious threat to the explorationist. The distribution and movement of sea ice on the continental shelf are hard to predict and have historically been responsible for the demise of several research vessels. Even less predictable is iceberg movement. Individual icebergs within the same area may drift at different speeds and in different directions because their size and draft determines to what extent

winds and currents affect them. Drift speeds up to 3 km/hr and drafts exceeding 400 m have been reported. Rugged topography and interstratification of stiff glacial deposits with water-saturated glacial-marine deposits combine to make the sea floor of the antarctic continental shelf and slope unstable. Evidence for this exists in the form of abundant sediment gravity flow deposits on the shelf and slope. To date, shallow gas has been observed only in the Bransfield Basin. Significant earthquake activity is virtually nonexistent. (Auth.)

F-44567

Hibler, W.D., III, **Sea ice response to global climatic change**, Brookhaven National Laboratory Workshop, Upton, NY, June 3-6, 1990. Proceedings. Global climate feedbacks. Edited by B. Manowitz, Washington, D.C., U.S. Department of Energy, 1990, p.125-150, CONF-9006134, 27 refs.

There are three broad areas where determining the physical mechanisms is important for developing a physically based understanding of the response of the high latitudes to climate change: sea ice dynamics and thermodynamics, the thickness distribution of sea ice and its evolution, and the coupling of sea ice with the ocean. In this article, aspects of these features that are relevant to climatic change are discussed, including some perspectives on recent research on sea ice cover in both the Arctic and Antarctic. (Auth. mod.)

F-44572

Dieckmann, G.S., Spindler, M., Lange, M.A., Ackley, S.F., Eicken, H., **Antarctic sea ice: a habitat for the foraminifer *Neogloboquadrina pachyderma***, *Journal of foraminiferal research*, MP 2932, Apr. 1991 21(2), p.182-189, 35 refs. For another version see 44-3824 or 18F-42109.

The pelagic foraminifer *Neogloboquadrina pachyderma* (Ehrenberg, 1861) occurs in new ice, congelation ice, and the underlying water column of the Weddell Sea. *N. pachyderma* is incorporated into the ice in large numbers at the time of its formation. The average number of foraminifers per liter of ice was 87 and numbers ranged between 0 and 1,075. Sea ice contained 70 times more foraminifers per unit volume than the underlying water column, and on an areal basis the sea ice cover has approximately the same number of specimens as 60 m of underlying water column. The foraminifera are usually incorporated into the ice when it is being formed dynamically and are thus subsequently associated mainly with granular ice. Many foraminifers are able to survive and grow in the ice where algal biomass in winter is high compared to the water column, perhaps indicating an overwintering strategy. Arctic sea ice, on the other hand, is practically devoid of foraminifers. These observations may have implications for paleoceanographers who use *N. pachyderma* as a tool to reconstruct past surface water conditions. (Auth.)

F-44581

Efimov, V.B., **Radar studies of antarctic glacier conditions**, *Soviet journal of remote sensing*, 1990(Pub. 1991) 8(4), p.565-579, Translated from Issledovanie Zemli iz kosmosa, Vol.10, No.4. 12 refs.

The data of side-scan radar on board the Kosmos-1500 and -1602 satellites for sensing antarctic glaciers are interpreted. A model of microwave scattering by glaciers is developed. Analytic solutions are considered for intense bulk scattering within a half-space with a rough upper boundary. (Auth.)

F-44584

Alley, R.B., **West antarctic collapse: how likely**, *Episodes*, Dec. 1990 13(4), p.231-238, Refs. p.237-238.

Studies in West Antarctica show that some of its ice streams move very rapidly, apparently because of significant basal lubrication. The

high ice-stream velocities result in local thinning of ice that might expand and bring about the collapse of the ice sheet. Another possibility is that a global greenhouse effect could warm the ocean waters circulating beneath the ice shelves and melt the ice at its base, even without melting the top surface of the ice. This could lead to the catastrophic collapse of the West Antarctic marine ice sheet and possibly parts of the East Antarctic and Greenland ice sheets as well. (Auth. mod.)

F-44613

Charles, D., **Earth's ice hangs in the balance**, *New scientist*, June 8, 1991 130(1772), p.22.

This note describes a proposed experiment to measure variations in the earth's ice cover by using remote signals from quasars or artificial satellites to detect tiny movements in the ground surface at the ice sheet edge. These movements would result from alterations in the mass balance of the ice sheet due to climatic changes, and are thought to be more easily perceptible in Antarctica and Greenland due to the extreme weight of these ice masses.

F-44686

Kim, D.H., Kwok, K.C.S., Smedley, D.J., Rohde, H.F., **Modelling of snowdrift around prismatic buildings for antarctic environment**, International Offshore and Polar Engineering Conference, First, Edinburgh, United Kingdom, Aug. 11-16, 1991. Proceedings, Vol.2. Edited by M.S. Triantafyllou et al, Golden, CO, International Society of Offshore and Polar Engineers, 1991, p.443-450, 23 refs.

In this paper, a number of similarity criteria, in particular time scaling, for the physical modelling of snowdrift in a wind tunnel are examined. Modeling of snowdrift was conducted in a purpose-built turbulent boundary layer wind tunnel. Iversen's (1980) proposed dimensionless time, which includes scaling of particle and fluid densities, Froude Number, particle threshold speed, mean wind speed, time and length, was found to produce a reasonable correlation of snowdrift accumulation rates between model and prototype. Tests were also carried out to investigate the relationships between different dimensions of prismatic buildings and snowdrift. The results were used to formulate design guidelines for buildings in Antarctica. (Auth. mod.)

F-44687

Smirnov, V.N., **Wave deformation of sea ice floes in the Antarctic due to storms and icebergs**, International Offshore and Polar Engineering Conference, First, Edinburgh, United Kingdom, Aug. 11-16, 1991. Proceedings, Vol.2. Edited by M.S. Triantafyllou et al, Golden, CO, International Society of Offshore and Polar Engineers, 1991, p.510-514, 9 refs.

Processes of wave generation in the antarctic sea ice are considered. Wind, swell and icebergs are main sources of elastic and gravity waves of wide dynamical and frequency ranges. Self-excited oscillations, similar to those taking place during splitting of the ice by engineering constructions, occurred at interactions between drifting ice and icebergs. (Auth. mod.)

F-44689

Blankenship, D.D., **Seismological investigations of a west antarctic ice stream**, Madison, University of Wisconsin, 1989, 265p., University Microfilms order No.DA8917633, Ph.D. thesis. 66 refs.

The question of what controls the dynamics of the fast-moving ice streams that drain the West Antarctic ice sheet is addressed using seismic reflection techniques. Specifically, experiments performed near the Upstream B camp (UpB) on ice stream B were designed to

test for a lubricating layer beneath the ice stream as well as for a preferred orientation of crystals within the ice. A lubricating layer would cause sliding of the ice over its bed and oriented crystals might be responsible for enhanced rates of deformation within the ice. Using seismic reflection profiles at near-vertical incidence, a laterally continuous layer was identified at the base of the ice. The top of this layer is smooth and its base is characterized by flutes trending parallel to ice flow. Oblique seismic reflections indicate that the layer is a saturated, unconsolidated sediment. The velocity anisotropy for reflected shear waves observed on ice stream B shows that the ice crystals are not oriented for easy horizontal shearing. Polarization of these shear waves are instead consistent with a down-flow axis of symmetry for the crystalline fabric. (Auth. mod.)

F-44709

Sheppard, D.S., Patterson, J.E., McAdam, M.K., **Mercury content of antarctic ice and snow: further results**, *Atmospheric environment*, 1991 25A(8), p.1657-1660, 14 refs.

Surface and subsurface snow and ice samples from a remote site on the Antarctic Plateau near the Victoria Land Dry Valleys have been analyzed for mercury. Ultra-clean sampling techniques followed by on-site extraction and analysis gave a mean result of 0.96 pg/g for surface snows, and 0.4 pg/g for samples from the 4.6 m deep pit. The results confirm the indications of a previous study, that the mercury levels in antarctic snows are very much lower than those determined in other studies. (Auth.)

F-44710

Boutron, C.F., **Direct determination of lead in Vostok antarctic ancient ice by laser excited atomic fluorescence spectrometry**, *Atmospheric environment*, 1990 24A(7), p.1797-1800, 14 refs.

Concentrations of lead (Pb) have been directly measured by laser-excited atomic fluorescence spectrometry down to pg/g level in six sections of the 2083 m Vostok deep antarctic ice core which had previously been mechanically decontaminated. Very small volumes of samples (20 microliters) were used, and there was no need for any preliminary chemical treatment or preconcentration step. The results are in very good agreement with those previously obtained for these core sections by isotope dilution mass spectrometry. (Auth.)

F-44716

Van der Veen, C.J., **State of balance of the cryosphere**, *Reviews of geophysics*, Aug. 1991 29(3), p.433-455, Refs. p.453-455.

The current state of balance of the terrestrial ice sheets and glaciers is poorly known. What little data are available suggest that, worldwide, mountain glaciers have receded since about the mid-nineteenth century, with occasional interruptions of the retreat. The interior part of the Greenland ice sheet appears to be thickening or in near equilibrium, but this ice sheet may be thinning in the coastal areas. Estimates of the mass balance of the antarctic ice sheet suggest that it is positive, although the error limits allow for a slightly negative balance. There is an urgent need to greatly improve the current estimates and to monitor the ice sheets continuously for changes in volume and extent. A program based on satellite observation techniques, in cooperation with ground-based surveys repeated over long time periods (many years or decades), appears to be most opportune to achieve this. (Auth.)

F-44731

Weatherly, J.W., Walsh, J.E., Zwally, H.J., **Antarctic sea ice variations and seasonal air temperature relationships**, *Journal of geophysical research*, Aug. 15, 1991 96(C8), p.15,119-15,130, 14 refs.

Monthly antarctic station temperatures are used in conjunction with grids of sea ice coverage in order to evaluate the temporal trends and the strength of associations between the two variables at lags of up to several seasons. Over the 30-year period 1958-1987 the trends of temperature are positive in all seasons. However, for the 15 years (1973-1987) for which ice data are available, the trends of temperature are predominantly positive only in winter and summer. The trends are most strongly positive over the Antarctic Peninsula. The spatially aggregated trend of temperature for this latter period is small but positive, while the corresponding trend of ice coverage is small but negative. Regional trends of both variables are larger. Cross correlations between concurrent anomalies of the two variables are negative over most of the continent and are strongest over the Antarctic Peninsula, especially in winter. Lag correlations between seasonal anomalies of the two variables are generally stronger, with ice lagging the summer temperatures and with ice leading the winter temperatures. The implication is that summer temperatures predispose the near-surface waters to above- or below-normal ice coverage in the following autumn and winter. The conclusions show little dependence on the choice of the sea ice data source or of the measure of sea ice (extent or areal coverage), but they do depend considerably on the method by which the data are geographically aggregated. (Auth.)

F-44733

Chumichev, B.D., Gorodetskiĭ, S.E., **Testing of antarctic ice with stamps** [Ispytaniia antarkticheskogo l'da shtampami], Problemy mekhaniki gruntov i inzhenernogo merzlotovedeniia; sbornik nauchnykh trudov (Problems in soil mechanics and engineering geocryology; collected scientific papers). Edited by I.U.K. Zaretskiĭ, Moscow, Stroizdat, 1990, p.252-257, In Russian. 2 refs.

Testing of natural glacier ice was conducted at the Molodezhnaya Station for the purpose of studying the interrelationship between ice stresses and deformation in order to base construction projects on and in the ice, to control load resting on the ice surface, and to resolve other engineering questions. Graphs and data show the development of the settling of a stamp under 1 deg of loading and unloading, and at various temperatures and pressures. (Auth. mod.)

F-44751

Anan'in, E.G., Boroukhin, E.A., Il'ichev, V.I., **Tritium in the snow and firn deposits at Vostok Station: results of analysis and methodological aspects**, *Water resources*, July 1991 17(5), p.545-549, Translated from Vodnye resursy, 1990, No.5. 6 refs.

The results of measuring tritium in the snow and firn deposits in 1972-1973 at Vostok Station are compared with the data for the Amundsen-Scott Station and a section from the Dumont d'Urville Station to Dome C. The new data do not contradict the hypothesis about an anomalous tritium fallout in 1973 in the polar region. The need to take into account the effect of this anomaly and processes of the distribution and redeposition of the snow-firn mass in the lower layers of the atmosphere when estimating the contribution of the "height" and "continental" effects is pointed out. The region of Dome C is prospective for obtaining such an estimate. The conditions of storing samples of antarctic firn for subsequent measuring of the tritium content in them are discussed. (Auth.)

F-44753

Li, J., Young, N.W., Malcolm, P.F., **Grain growth in firn on Law Dome ice cap, East Antarctica**, *Antarctic research*, 1990 2(4), p.11-20, In Chinese with English summary. 18 refs.

The detailed studies of firn grain mean area at 16 sites on Law Dome indicate that the enhanced grain growth, in several meters near the snow surface, is more apparent in low accumulation areas, declining with the increase of accumulation rate. This can be attributed to

the short staying period of snow near the surface, caused by the higher accumulation rate. The variation of mean grain area with both depth and age can be approximately represented by linear relations. The rate of increase of mean area versus depth decreases markedly with accumulation rates, due to very large differences in accumulation rates between the sampling sites. Growth rate versus temperature, at about -17 C, starts to depart from the temperature dependence of crystal growth rate established by Gow (1975), suggesting that the activation energy for the growth process increases with increasing temperature. (Auth.)

F-44754

Huang, M.H., Wang, W.T., Li, J., Li, G., **Repeated compression-annealing experiments on anisotropic core ice**, *Antarctic research*, 1990 2(4), p.21-27, In Chinese with English summary. 12 refs.

Three runs (6 samples) of repeated uniaxial compression-annealing experiments were conducted on a creep testing machine with a loading precision within 1% at -2 ± 0.2 C. The tested samples were cut from a BHQ ice core. The samples were compressed with an initial axial stress of 0.8 MPa, until 10% axial strain was obtained, and then annealed for 72 hours. Such compression-annealing procedure was repeated 6 times for each run. The experimental results show that under a warm temperature and large load, the initial features of structure and fabric disappear, a small circle girdle fabric with fine equigranular grains appears, and a multi-maxima fabric develops to some extent. Analysis of structure and fabric shows that the formation mechanism of new fabrics in these experiments is principally recrystallization. With the repetition of compression-annealing, the difference in the fabric of the 6 samples decreases, their rheological behavior tends to be uniform, and their grain size decreases towards a steady state value. (Auth. mod.)

F-44761

Drewry, D.J., Turner, J., Rees, W.G., **Contribution of Seasat to ice sheet glaciology**, *International journal of remote sensing*, Aug. 1991 12(8), p.1753-1774, Refs. p.1772-1774.

The suite of sensors flown onboard Seasat during 1978 has provided glaciologists with valuable tools for the study of ice masses, particularly in the polar regions. Of the sensor package, the most useful instruments for glaciology have been the radar altimeter and the synthetic aperture radar. The former has demonstrated the ability to map the surface of ice sheets in considerable detail and over a very short period of time. Such maps provide the first step towards evaluating the long term mass balance of these ice masses. Such studies are of central importance to global climate modelling, investigation of the 'greenhouse effect' and prediction of world sea levels. Radar altimeter mapping has also provided unparalleled detail on surface topography relevant to ice dynamics investigations. The small dataset of Seasat Synthetic Aperture Radar (SAR) imagery gathered over ice masses, principally in Iceland and Greenland (there was no coverage of Antarctica), has begun to reveal useful detail of surface and near-surface phenomena such as flowlines, meltwater percolation, and snow and ice facies invaluable for glaciological reconnaissance. In particular, recent studies have shown the value of a multisensor approach with the combination of SAR and multi-spectral imagery. It is likely that X- and C-band SARs will prove better for snow and ice discrimination than the L-band system on Seasat. The Scatterometer and Scanning multi-channel microwave radiometer instruments on Seasat have yielded data over ice masses which are still in the early stages of evaluation. Nevertheless there are strong indications of the value of these data for investigation of surface melt phenomena and temperature-accumulation patterns. (Auth. mod.)

F-44762

McIntyre, N., **Mapping ice sheets with the altimeter**, *International journal of remote sensing*, Aug. 1991 12(8), p.1775-1793, 31 refs.

The most basic glaciological requirement for investigations of ice sheets and ice shelves is a measurement of surface elevation. Prior to 1978, no technique operated from the surface, aircraft or satellites had provided elevation data with sufficient accuracy and spatial temporal coverage to address continent-wide problems such as whether the antarctic ice sheet is growing or shrinking. Although on an oceanographic mission, Seasat gave the first extensive evidence that a satellite radar altimeter can achieve high precision mapping for widespread glaciological application. In the decade since its launch, analysis of data from its brief mission has showed the capability of measuring elevations to an accuracy of up to 25 cm, mapping the outer margins of ice shelves, identifying grounding lines, profiling icebergs and providing information on surface features. Although problems such as coverage, mission continuity and special data processing still need to be addressed, Seasat has demonstrated the very real contributions which future altimeters such as that to be flown on ERS-1 will make to studies of the polar regions. (Auth.)

F-44771

Delisle, G., Sievers, J., **Sub-ice topography and meteorite finds near the Allan Hills and the Near Western Ice Field, Victoria Land, Antarctica**, *Journal of geophysical research*, Aug. 25, 1991 96(E1), p.15,577-15,587, 24 refs.

In this paper, glaciological causes of large meteorite concentrations on blue ice fields west and southwest of the Allan Hills in Antarctica have been investigated. A sub-ice topography map for the area was prepared from data of a radio echo sounding survey. The map reveals a mesa-type paleosurface formed prior to and modified by glacial processes during the initial stage of glaciation of Antarctica. Ice flow toward Mawson Glacier north of the Allan Hills is largely confined to a N-S trending depression between the Allan Hills Ice Field and the Near Western Ice Field. Blue ice at the margins of the ice stream flows over the mesas on both sides of this depression. Meteorites entrained in blue ice are uncovered by sublimation and ablation. It is proposed that currently almost all of the blue ice flowing into the Allan Hills Ice Field is sublimated, leaving meteorites on the ice surface, and that windblown meteorites are trapped by snow bridges across crevasses, resulting in a near-surface meteorite concentration near the ice ridges of the Allan Hills Ice Field. Nevertheless, most meteorites are exposed for only a short period of time to the atmosphere before they are blown by the wind across the ice toward the western foot of the Allan Hills, from where they are slowly carried northward to Mawson Glacier and the Ross Sea. (Auth. mod.)

F-44773

Mosley-Thompson, E., **Glaciological studies at Siple Station (Antarctica): potential ice-core paleoclimatic record**, *Journal of glaciology*, 1991 37(125), p.11-22, 36 refs.

The quality and utility of the records of oxygen-isotopic abundances, dust concentrations and anionic concentrations preserved in the ice at Siple Station are assessed from four shallow (20 m) cores. The combination of high accumulation (0.56 m/a w.e.) and low mean annual temperature (-24 C) preserves the prominent seasonal variations in (delta)O-18 which are very spatially coherent. Sulfate concentrations vary seasonally and, in conjunction with (delta)O-18, will allow accurate dating of deeper cores from Siple Station. The concentrations of insoluble dust are the lowest measured in Antarctica, making Siple Station an excellent location to examine large increases in atmospheric turbidity. The seasonal variations and annual fluxes of the anions are examined for the last two decades (1966-85) with regard to probable sources. An unusually high sulfate flux in 1976 may reflect the Feb. 1975 eruption of Mount Ngauruhoe, New Zea-

land. No annual signal in nitrate concentration is confirmed and no unusually high nitrate fluxes support the suggestion of nitrate production by large solar flares. However, nitrate flux is higher for the latter half of the 1970s and early 1980s, possibly reflecting the recent loss of stratospheric ozone. Finally, comparison of the (δ)O-18 record with available surface-temperature data (1957-85) reveals that multi-year trends along the western coast of the Antarctic Peninsula are recorded at Siple. More importantly, comparison with areally weighted temperature reconstructions suggests that the (δ)O-18 record may reflect larger-scale, persistent trends in the high southern latitudes. The strong spatial coherence of the preserved records, the potential for accurate dating, and possible relevance to larger-scale processes make Siple Station an excellent site for paleoenvironmental reconstruction from ice cores. (Auth.)

F-44774

Smith, A.M., **Use of tiltmeters to study the dynamics of antarctic ice-shelf grounding lines**, *Journal of glaciology*, 1991 37(125), p.51-58, 14 refs.

New tiltmeter data are presented from Doake Ice Rumples on Ronne Ice Shelf. Five sites which showed a tidal ice-shelf flexure have been analyzed using an elastic beam model to investigate the variation of flexure amplitude with distance from the grounding line. An earlier study on Rutford Ice Stream which also used an elastic model required an ice thickness much less than that observed. Re-working the Rutford Ice Stream data suggests that this greatly reduced ice thickness is not required, given the current sparse data coverage. The elastic model is used to improve the estimated grounding-line position on Rutford Ice Stream. Some of the difficulties in modeling ice-shelf flexure and locating grounding lines are discussed. (Auth.)

F-44775

Fily, M., Benoist, J.P., **Large-scale statistical study of Scanning Multichannel Microwave Radiometer (SMMR) data over Antarctica**, *Journal of glaciology*, 1991 37(125), p.129-139, 31 refs.

Scanning Multichannel Microwave Radiometer (SMMR) data over Antarctica have been statistically analyzed for four different periods of 1 year (1981) and compared to geophysical data such as surface temperature, snow-accumulation rate and topography. The spatial variations of the microwave signature are stable with time. Although the ten channels are highly correlated, principal-component analysis reveals the importance of polarization and frequency. The difference between brightness temperatures at the two polarizations is found to be dependent on the atmospheric water-vapor fluxes over the ice sheet, which modify the temperature-accumulation ratio and therefore the snow stratification. The brightness-temperature gradient with frequency is related to the topography of the central plateau area. A more important subsidence over diverging areas could explain the different structure of the accumulated snow. (Auth. mod.)

F-44776

Fastook, J.L., Hughes, T.J., **Changing ice loads on the Earth's surface during the last glaciation cycle**, Glacial isostasy, sea-level and mantle rheology. Edited by R. Sabadini, K. Lambeck, E. Boschi, Dordrecht, Kluwer Academic Publishers, 1990, p.165-201, 27 refs.

The last (Wisconsin-Weichselian) glaciation cycle occurred from 120,000 to 6000 years ago. The authors have simulated advance and retreat of ice sheets for this cycle using the map-plane solution of a time-dependent, finite-element gridpoint computer model. Two square grids (one centered on each pole) were employed, with gridpoints spaced 100 km apart. Input at each gridpoint included constants in the flow and sliding laws of ice, bed topography, fractions of bed over which sliding dominates flow, degree of glacioisostasy (isostatic equilibrium was assumed), and surface accumulation or ablation rates. Output at each gridpoint includes ice elevation, ice thickness,

and ice velocity vectors. Time steps for input and output are variable. In this experiment, snowline slope was held constant and snowline elevation was lowered sinusoidally about 1000 m over 20,000 years, held constant for 60,000 years, and raised sinusoidally over 20,000 years. Advance and retreat of ice sheets are presented in eleven time steps for North American and Eurasian Ice Sheets, and three time steps for the Antarctic Ice Sheet. Changes over time of total ice volume and ice volume contributing to sea level are computed. (Auth.)

F-44835

Zagorodnov, V.S., Heintzenberg, J., Watanabe, O., Fujii, Y., **Automated measurements of crystal dimensions and concentration of inclusions in ice cores: methods and first results**, *Cold regions science and technology*, Aug. 1991 19(3), p.327-333, 12 refs.

This paper describes an experimental set-up for the automated measurement of linear dimensions of crystals in samples of artificial and natural ice, and shows the feasibility of automatic measurements of concentration and dimensions of air inclusions. The theoretical rate of measurements of the above mentioned parameters can reach 1000 per second, corresponding to a travel speed of about 1 m/s when moving the sensors along an ice core. The narrow beam laser optics allow the detection of ice inclusions down to about one micrometer in diameter. Samples analyzed include cores acquired at Mizuho Station during the 25th Japanese Antarctic Research Expedition in 1984. (Auth. mod.)

F-44837

Bozhkov, A.T., Bulatov, L.V., Riabkov, G.E., **Hydrometeorological conditions in the Antarctic in 1984** [Gidrometeorologicheskie usloviia v Antarktike v 1984 g], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.62-69, In Russian. 2 refs.

An analysis is reported of the ice processes in the southern ocean and the atmospheric circulation in the South Polar region based on data from antarctic stations, ships and radar satellite images. Included are decadal ice maps, results from observations of coastal ice, daily weather maps for the Southern Hemisphere, average monthly surface pressure and geopotential charts, air temperature and pressure anomalies, and meridional atmospheric circulation data. The monthly average position of the ice edge varied from 2-4 deg in latitude; the fast ice width ranged between 20 and 40 miles, and its thickness varied by 10 to 15 cm.

F-44840

Efremov, I.U.V., **Formation and destruction of artificial barrier snowdrifts** [Formirovanie i razrushenie iskusstvennykh pribar'ernykh snezhnikov], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.84-92, In Russian. 7 refs.

Experiments were carried out to study the formation of natural and artificial snowdrifts in the region of Cape Granat, and the most effective method to accumulate and preserve barrier snowdrifts. The following was found: the most favorable conditions for observation occur during easterly and southeasterly winds blowing at speeds not greater than 18 m/s; the snow accumulates most intensely during the months of June and Sep.; the application of latticed shields is the most expedient method for snow retention; the most significant factor in the destruction of snowdrifts is the thermodynamic influence of the sea.

F-44843

Bozhkov, A.T., **Scientific and operational provision of ice information for navigation** [Nauchno-operativnoe obespechenie sudokhodstva ledovoï informatsii], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.127-134, In Russian.

Material collected during several expeditions showing the scientific and operational provision of ice information for navigation at Molodezhnaya Station between Jan. 1983 and Apr. 1985 is analyzed. Graphs and tables show the distribution—by year, month, location and the source, number, and type—of requests. These, and the satellite processing of the information forwarded to research vessels and fishing expeditions in antarctic waters, are discussed.

F-44851

Miller, H., ed, Oerter, H., ed, **Expedition ANTARKTIS-VIII of RV *Polarstern* 1989/90: Report of Leg ANT-VIII/5** [Die Expedition ANTARKTIS-VIII mit FS *Polarstern* 1989/90: Bericht vom Fahrtabschnitt ANT-VIII/5], *Berichte zur Polarforschung*, 1991 No.86, 155p., In German with English summary. Refs. passim.

The account is given of the Expedition which performed extensive glaciological and seismic work through the northeastern Weddell Sea to Atka Bay. Biological studies of penguins and seals were also made in this area. Additional observations were made from *Polarstern* between Kap Norwegia and the Antarctic Peninsula from mid-Jan. through mid-Feb. 1990. The Filchner-Ronne Ice Shelf glaciological/meteorological programs were undertaken during this same period. Programs were delayed during the entire season due to illness, injury, and various necessary but disruptive logistic requirements. By mid-Feb., the Expedition had completed its programs and began preparations for return to Germany.

F-44854

Augstein, E., Bagriantsev, N., Schenke, H.W., **Expedition ANTARKTIS VIII/1-2, 1989 with the Winter Weddell Gyre Study of the research vessels *Polarstern* and *Akademik Fedorov*** [Die Expedition ANTARKTIS VIII/1-2, 1989 mit der Winter Weddell Gyre Study der Forschungsschiffe *Polarstern* und *Akademik Fedorov*], *Berichte zur Polarforschung*, 1991 No.84, 134p., In English with overall summary in German; p.47-53 in German with English summary.

The Winter Weddell Gyre Study 1989 (WWGS'89) is a joint research project of the German vessel *Polarstern* and the USSR vessel *Akademik Fedorov* to investigate the oceanic circulation of the Weddell Sea at the end of the austral winter. This operation was the first of a total of four similar campaigns by which the mass, heat, salt and sea ice transports of the Weddell Gyre and the water mass modification in the southerly Weddell Basin will be quantitatively determined. The oceanic core program is complemented by detailed studies of sea ice dynamics, air-sea ice-water interactions, sea ice remote sensing, sea ice biota as well as the temporal and regional variations of the phyto- and zooplankton development in the Weddell Gyre regime. The recent cruises have supported measurements along four transects perpendicular to the oceanic circulation of the Weddell Sea. The zonal most southerly and the meridional most easterly track lines provide hydrographic sections across the entire gyre system, while the two others cover the northwesterly part of the eastward branch of the flow. The scientific field work in 1989 was primarily directed towards oceanography in the Weddell Sea, Maud Rise orography, sea ice physics and biology, remote sensing of sea ice, and ozone detection in the polar vortex. (Auth. mod.)

F-44862

Van Ypersele, J.P., **Modelling sea ice for climate studies**, Climate-ocean interaction. Edited by M.E. Schlesinger, Dordrecht, Netherlands, Kluwer Academic Publishers, 1990, p.97-123, Included in proceedings of a workshop organized jointly by NATO and the Commission of the European Communities, Oxford, UK, Sep. 26-30, 1988. Refs. p.119-123.

This article reviews the state of the art of sea ice modelling for climatic purposes. The large variability of sea ice, its effects on atmosphere and ocean dynamics and its sensitivity to small changes in climate variables make the inclusion of an interactive sea ice model necessary in modern climate models. The ultimate sea ice model now appears to be one in which sea ice is fully coupled by heat, salt and momentum fluxes to an ocean and atmosphere model. Before discussing the elements needed in fully coupled models, the hierarchy of existing thermodynamic and dynamic models is reviewed, and the principal methods used are described. The elements needed for coupled modelling are then discussed, and examples of ocean/sea-ice coupled models are presented. Perspectives on possible and needed progress in sea-ice modelling are outlined. Included is a simulation of Weddell Sea ice cover thickness using thermodynamic and other variables. (Auth. mod.)

F-44903

U.S. Naval Polar Oceanography Center, **Antarctic ice charts 1987-1988**, Washington, D.C., 1988, 99p. ADA-231 965.

This document consists of charts portraying approximately 7-day analyses of sea ice, prepared by the Naval Polar Oceanography Center, Suitland, MD. Included are ice concentrations and ice thickness (age). (Auth.)

F-44922

Suitz, T., **Development of a radar for crevasse detection**, International Symposium on Noise and Clutter Rejection in Radars and Imaging Sensors, 1989. Proceedings. Edited by T. Suzuki, H. Ogura and S. Fujimura, [IEICE,] 1989, p.666-669, 2 refs. For another version see 45-3068 or G-44277.

A new radar to detect a crevasse was developed. The characteristics of the instrument are shown. A preliminary experiment to measure the distances of four targets made of plywood board was made in an anechoic chamber to confirm the fundamental characteristics of the radar. Another preliminary experiment to detect a hole dug in a snow pile was made to find out the usefulness of this radar for crevasse detection. A basic experiment to examine scattering characteristics of an actual crevasse, whose location is well known in Antarctica, is planned. (Auth. mod.)

F-44923

Uratsuka, S., Okamoto, K., Nishio, F., Mineno, H., Mae, S., **Sea ice thickness measurement using step frequency radar**, International Symposium on Noise and Clutter Rejection in Radars and Imaging Sensors, 1989. Proceedings. Edited by T. Suzuki, H. Ogura and S. Fujimura, [IEICE,] 1989, p.656-661, 11 refs.

Ground based experiments of UHF step frequency radar were carried out on the sea ice near Showa Station. These are the first experiments to measure sea ice thickness using a step frequency radar system. The echoes from snow/ice and ice/water interfaces were detected. The snow depth and ice thickness are in good agreement with direct measurement of the drill hole. (Auth.)

F-44924

Suitz, T., Uratsuka, S., Okamoto, K., Watanabe, O., Nishio, F., **Development of a short pulse radar for crevasse detection**, *Communications Research Laboratory*, Dec. 1989 35(177), p.545-549, In Japanese with English summary. 6 refs.

Since 1987, the Communication Research Laboratory (CRL) has been developing a new radar system for the detection of hidden crevasses in conjunction with the National Institute of Polar Research (NIPR). The CRL radar employs a very short C-band pulse (1 ns) together with a pencil beam antenna which can be scanned over the snow surface by changing the azimuth and elevation (or incidence) angles. The antenna is mounted on the top of a snowmobile with the transmitter, receiver and signal processor being placed inside. The purpose is to remotely detect hidden crevasses in front of the snowmobile by transmitting a short pulse to the snow surface and detecting and analyzing the echo signals with range-gate methods. The characteristics of the instrument and results of a preliminary experiment to confirm the characteristics of the radar are shown. (Auth.)

F-44941

Gao, C.H., Wang, S.J., **160,000 years record of isotope temperature and atmospheric CO₂ from Vostok ice core**, *Journal of glaciology and geocryology*, Sep. 1990 12(3), p.259-268, In Chinese with English summary. 3 refs.

The 2,083 m ice core taken at Vostok first reveals a continuous climatic series of the past 160,000 years over continental areas. The last glacial period, with two warming intervals, began at about 110,000 years. The temperature in the last glacial maximum was about 9 C colder than the average Holocene temperature. It is confirmed that the warmest part of the last interglacial period was about 2 C warmer than that of the Holocene. There is a similarity between the variation of the atmospheric CO₂ concentration and the stable isotope temperature in the ice core. The CO₂ concentration was high in the warm period, with a value of 263 ppmv in Holocene and 272 ppmv in the last Interglacial period. The CO₂ concentration was low in the glacial period, with a concentration of 240-190 ppmv. Based on the spectral analysis and multivariate analysis, it has been shown that the climatic changes would be triggered by insolation changes, and the CO₂ would amplify effects of the insolation which were relatively weak. (Auth.)

F-44973

Massom, R.A., **Satellite remote sensing of polar regions; applications, limitations and data availability**, London, Bellhaven Press; Boca Raton, FL, Lewis Publishers, 1991, 307p., Refs. passim.

This is a comprehensive overview of the current technology and practice in satellite remote sensing of polar regions. It is presented in two parts; the first covers history, general principles, data processing techniques, and future developments. Part II gives operational data on past, present and future satellites in this program. The author illustrates with sample data from various polar regions, including the Weddell Sea, Queen Maud Land, and Antarctica as a whole.

F-44975

Morris, J.D., **Applications of cosmogenic Be-10 to problems in the earth sciences**, Annual review of earth and planetary sciences, Vol.19, Palo Alto, CA, Annual Reviews Inc., 1991, p.313-350, Refs. p.345-350.

Accelerator mass spectrometry (AMS) is used to measure Be-10 in ice cores. Be-10, with a half-life of 1.5 million years, is produced by nuclear spallation reactions of cosmic rays with O and N in the atmosphere. The higher the cosmic ray intensity, the higher the Be-10 concentration, therefore concentrations of Be-10 in ice cores provide a record of past variations in cosmic ray intensity. A high Be-

10 concentration may indicate an increase in solar activity or a decrease in the Earth's cosmic ray-shielding magnetic field. Comparisons of Be-10 with O-18, CO₂, and CH₄ in the Vostok ice core from Antarctica and other ice cores from Greenland suggest that temperatures were 8 C lower and precipitation 2 to 3 times less during the last glacial maximum than in the Holocene.

F-44984

Lytle, V.I., Ackley, S.F., **Sea ice ridging in the eastern Weddell Sea**, *Journal of geophysical research*, MP 2973, Oct. 15, 1991 96(C10), p.18,411-18,416, 17 refs.

Sea ice ridge heights and spatial frequency in the eastern Weddell Sea were measured in 1986 using a ship-based acoustical sounder. Using a minimum ridge sail height of 0.75 m, a total of 933 ridges were measured along a track length of 415 km. The ridge frequency varied from 0.4 to 10.5 ridges/km. The mean height of the ridges was found to be about 1.1 m regardless of the ridge frequency. These results are compared to other ridging statistics from the Ross Sea and found to be similar. Comparison with arctic data, however, indicates that the height and frequency of the ridges are considerably less in the Weddell Sea than in the Arctic. Whereas in the Arctic the mean ridge height tends to increase with the ridge frequency, this was not the case in the Weddell Sea, where the mean ridge height remained constant irrespective of the ridge frequency. Estimates of the contribution of deformed ice to the total ice thickness are generally low, except for a single 53 km section where the ridge frequency increased by an order of magnitude. This resulted in an increase in the equivalent mean ice thickness due to ridging from 0.04 m in the less deformed areas to 0.45 m in the highly deformed section. These values were found to be consistent with values obtained from drilled profile lines during the same cruise. (Auth. mod.)

F-44992

Eicken, H., Ackley, S.F., Richter-Menge, J.A., Lange, M.A., **Is the strength of sea ice related to its chlorophyll content**, *Polar biology*, MP 2974, Sep. 1991 11(5), p.347-350, 18 refs.

Results of uniaxial compression tests are compared to porosity and chlorophyll content of granular sea-ice samples, collected in the Weddell Sea from June to Nov. of 1986. Compressive failure stresses are significantly correlated with the total porosity of the ice, but exhibit no correlation with chlorophyll concentration. It is suggested that high chlorophyll concentrations may accompany low ice strengths only because high porosities, which are responsible for low mechanical strength, can be linked to sea-ice biology. High concentrations of ice algae may be either cause or effect of high porosities (through absorption of solar radiation in the first case or due to enhanced nutrient supply and environmental space in the second case). As a cause of high porosities, ice organisms could therefore indirectly influence the spring breakup of floes and thus the course of the ablation season. (Auth.)

F-45000

Fisher, D.A., **Remarks on the deuterium excess in precipitation in cold regions**, *Tellus*, Nov. 1991 43B(5), p.401-407, 17 refs.

Jouzel and Merlivat developed and used an expression for the kinetic fractionation coefficients α_k , and greatly improved the predictions of $\delta(O-18)$ and d , (the deuterium excess) for East Antarctica. The α_k coefficient is re-derived in terms of ambient cloud temperatures and is used to re-calculate their single-source East Antarctic simulations. While the "improved" α_k produces virtually no change in the δ 's, there is a small change in predicted d , s. However, no matter which α_k is used, the simulated d 's are very sensitive to the supersaturation history of the precipitating air mass. The single-source model is run for a wide range of supersaturation histories. Averaging the resulting suite of $\delta(O-18)$ and d solutions gives reasonable and stable d predictions. The temperature

*T*s at which clouds switch from being supercooled water drops to ice crystals depends in part on the microparticle loading of the air. The value of *T*s significantly influences the *d*'s and even *delta*'s predicted. Thus ice-core microparticles *d* and *delta* might be "process related". (Auth.)

F-45058

Qin, D.H., **Developing and physical characteristics of first-year sea ice in Great Wall Bay and its adjacent area by King George Island, Antarctica**, *Journal of glaciology and geocryology*, June 1991 13(2), p.115-130, In Chinese with English summary. 16 refs.

The detailed evolution and the profile of ice thickness, pH value, salinity, the structure and fabric of the first-year sea ice in Great Wall Bay and its adjacent area on King George I., are described. The period of sea ice cover is short, and its stability is low. Ice core analysis shows that the sea ice consists mainly of snow ice in the Bay (over 70% of the thickness), and that the sea ice increases both upwards and downwards, characterized by snow ice upwards and congelation ice downwards. Snow ice contains interstitial water which refreezes and remelts alternatively during the seasons with weather changes. This process makes it difficult to calculate the ice thickness from the classical Stefan formula. There is a dendritic ice phenomenon, with ice plates and brine lamellae both in congelation ice and the bottom of snow ice. In addition, the ice-axis alignment direction in congelation ice and snow ice is different from that in other regions. The ice fabric diagram of congelation ice is a weak small circle, and that of snow ice has a shape of central symmetry. (Auth. mod.)

See also:

A-43079 A-43124 A-43833 A-44763 B-43512 B-43606 B-43811
B-43872 B-43885 B-43932 B-43934 B-44087 B-44229 B-44362
B-44363 B-44396 B-44399 B-44422 B-44526 B-44587 B-44791
B-44792 B-44794 B-44795 B-44798 B-44800 B-44801 C-43078
C-43113 C-43724 C-43835 C-44667 C-44772 E-42975 E-42976
E-43059 E-43060 E-43063 E-43099 E-43111 E-43125 E-43132
E-43160 E-43161 E-43252 E-43253 E-43285 E-43289 E-43314
E-43412 E-43413 E-43563 E-43867 E-43879 E-43904 E-43905
E-44227 E-44263 E-44336 E-44542 E-44720 E-44752 E-44844
E-45032 E-45033 G-42893 G-43154 G-43454 G-44277
G-44286 G-44287 G-44638 I-43095 I-43232 I-43233 I-43248
I-43610 I-43678 I-43737 I-43852 I-43910 I-43911 I-44015
I-44267 I-44269 I-44270 I-44285 I-44416 I-44622 I-44841
I-44842 I-44866 I-44880 I-44971 I-44972 J-43134 J-43137
J-43365 J-43661 J-43779 J-43881 J-43896 J-43930 J-43972
J-44086 J-44088 J-44256 J-44274 J-44319 J-44324 J-44329
J-44465 J-44694 J-44777 J-44778 J-44853 J-44855 K-44766
L-43293 L-43607 L-43613 L-43708 L-44187 L-44412 L-44470

G. LOGISTICS, EQUIPMENT & SUPPLIES

G-42893

Ishizawa, K., Takeuchi, S., Takahashi, A., **Borehole drilling for sewage disposal and rise of the hole's bottom at Asuka Station, East Antarctica**, *Antarctic record*, July 1990 34(2), p.145-155, In Japanese with English summary. 10 refs.

A borehole for sewage disposal was drilled in the snow at Asuka Station in Jan. 1987. The borehole, 400 mm in diameter and 27.5 m in depth, was drilled at 50 m apart from the main hut using a steam drilling system. The drilling speed was 4 m/h between the surface to 20 m depth. Total amount of kerosene used for melting snow and steam generation was 110 liters. Sewage stored in 3 tanks is directed to the borehole through a heated pipe. The bottom of the borehole rose about 7 m in the first 5 months; after that the rising speed decreased gradually. The bottom rose 11.6 m up during a period of 3 years when 594 kl waste water was discharged. If we assume the contaminated area is cone-shaped, the cone's radius is calculated as 13.7 m. (Auth.)

G-43154

Moore, R.K., Davis, C.H., Xin, W., Dean, R.H., **Radar depth sounding near Upstream B camp—December 1988**, *Antarctic journal of the United States*, 1989 24(5), p.85-86, 2 refs.

During the 1988-1989 austral summer a University of Kansas team used the Coherent Antarctic Radar Depth Sounder (CARDS) for a survey at the Upstream B area as part of the Siple Coast Project. CARDS is a 150-megahertz pulse radar using pulse compression and coherent integration to achieve fine resolution and high sensitivity. Its range resolution is 6 m. With a peak power of only 20 watts, it achieves an equivalent peak power of 900 kilowatts by coherent integration. It may be operated from an airplane or a tracked vehicle. Sample records of ice sounding echoes are included.

G-43335

Becker, R.A., **Antarctic support operations, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.279-280.

ITT/Antarctic Services, Inc., (ANS) with headquarters in Paramus, NJ, oversees the provision of personnel, materials, and specialized logistics to USAP's four major stations and remote field sites in the Antarctic. Offices in Port Hueneme, CA, and Christchurch, New Zealand, support continental antarctic activities, while support of Antarctic Peninsula and ship operations are provided through maritime agents in South America. ANS's principal tasks include: support of USAP-sponsored scientific research projects and visitor events; the operation and maintenance of facilities at McMurdo Station, Williams Field, Amundsen-Scott South Pole Station, Siple Station, Palmer Station, and field camps; engineering and construction of new facilities and the renovation of existing infrastructure systems throughout the Antarctic; and operation of the research vessel R/V *Polar Duke* and other ice-strengthened, subcontracted vessels.

G-43336

Reed, L., **U.S. Naval Support Force, Antarctica: station operations, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.281-282.

McMurdo Station must rely upon a system of smooth interdepartmental operations to meet its objectives. The parent U.S. military

contingent, U.S. Naval Support Force Antarctica (NSFA), helps to accomplish this goal with an organization consisting of nine departments: administration, communications, operations, supply, public works, medical, terminal operations, morale/welfare/recreation, and safety/training. Example of some of the diversity of tasks involved include: air traffic control, MARS phone patching, cold weather clothing tests, movement of cargo and passengers to, from, and within Antarctica, and medical services, which during this season included support to the passengers and crew of the vessel *Bahia Paraiso*, which sank near Palmer Station.

G-43337

Reed, L., **U.S. Naval Support Force, Antarctica: detachment operations, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.282-284.

Naval Support Force Antarctica carries out its mission from four locations. During the austral summer season, the main body of NSFA personnel deploys to McMurdo Station. Two other detachments provide technical and logistical support for McMurdo, and the unit's homeport headquarters at Port Hueneme, CA, and a logistic staging area at Christchurch, New Zealand. During the winter season, command of the support force in McMurdo is turned over to a detachment officer-in-charge. This action formally establishes the fourth location, Detachment McMurdo. The functions and tasks of these detachments and their relationships to each other and to USNS-FA are briefly outlined.

G-43339

Reed, L., **U.S. Naval Support Force, Antarctica: ship operations, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.286-287.

One U.S. Coast Guard and two civilian contract ships traveled to McMurdo Station during the 1988-1989 summer season. USCGC *Polar Star* remained in Seattle on standby from Jan. 1 through Feb. 28. The USCG *Polar Sea* (WGAB-11) provided icebreaking support; the M/V *Paul Buck* transported fuel to the station and unloaded retrograde fuel; and the M/V *Green Wave* resupplied the station to meet the needs of the upcoming winter season.

G-43340

Tremblay, L.A., **U.S. Navy Antarctic Development Squadron Six activities, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.287-288.

The report provides a brief outline of the personnel assigned to DEVRON-6 and the kind of support they furnished to the Deep Freeze operation, including flight/ground training for air and maintenance crews, WIN-FLY, direct support flights to science field parties, two search and rescue exercises, and two real search and rescue operations.

G-43454

Klokov, V.D., Poliakov, S.P., **Experimental construction of ice moorings in Antarctica using the spray-cone freezing method** [Eksperiment po sozdaniiu ledovogo prichala v Antarktide metodom fakel'nogo namorazhivaniia], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovaniĭ*, Jan. 1990 Vol.68, p.106-110, In Russian with English summary. 7 refs.

Experimental ice moorings constructed by the method of artificial spray-cone freezing in the coastal area of Opasnaya Bay are described. A pump with a capacity of 100-185 cu m/g was used as a spraying installation. The greatest dispersion of drops and the maximum values of ice formation coefficient (up to 45%) were achieved with nozzle diameters of 35-45 mm and the wind-facing direction of the water cone. The density of artificially frozen ice varied from 500-900 kg/cu m, the strength was 0.5-1.2 MPa, and its salinity was 4-15 per mill. (Auth.)

G-43564

Blaisdell, G.L., Kurtti, K., **Design of a modified Caterpillar Challenger tractor for antarctic service, U.S. Army Cold Regions Research and Engineering Laboratory**, MP 2829, June 1990 13p. + figs., 2 refs.

The Caterpillar Challenger tractor, modified by an extended track, is recommended as a replacement for the Caterpillar LGP D8 low-ground-pressure tractor in the National Science Foundation's antarctic vehicle fleet. The LGP D8 tractors are now over 30 years old and many of their parts have become unavailable. The Challenger tractor can be used for pulling tracked trailers or sleds with a payload up to 40 tons and at a top speed of 18 mph.

G-43806

Marklund, S., **Water conservation at the antarctic Wasa Base—results 1989-90**, International Cold Regions Engineering Specialty Conference, 6th, West Lebanon, NH, Feb. 26-28, 1991. Proceedings. Edited by D.S. Sodhi. Cold regions engineering, New York, American Society of Civil Engineers, 1991, p.85-94, 2 refs.

The Swedish Wasa Base was erected in the Norwegian sector of Antarctica during the 1988-89 summer season. The base consisted of a house with full living facilities for 10 people and a machine building. The sanitary system consisted of indoor running hot and cold water, a dishwasher, a washing machine, two showers, a sauna and two dry toilets. All sanitary installations were, at the time of delivery, standard manufactured versions chosen to be water conservative. The specific water demand for 1989-90 summer season was 62.8 l or 16.6 gal per day. Of that 1/3 was used in the kitchen and 1/4 each for laundry and showers/sauna. (Auth. mod.)

G-43807

Osgood, S.G., Haehnle, R.J., **Environment One: a master plan study for a new scientific research station at the geographic South Pole**, International Cold Regions Engineering Specialty Conference, 6th, West Lebanon, NH, Feb. 26-28, 1991. Proceedings. Edited by D.S. Sodhi. Cold regions engineering, New York, American Society of Civil Engineers, 1991, p.250-271, 15 refs.

This master plan study focusses on determining the technical and functional requirements of a new facility. Technical requirements are those aspects of the station affected and determined by the extreme climate. Functional requirements are those dictated by contemporary research needs. Environment One will establish the groundwork for the design and construction of an Amundsen-Scott Station that will support globally significant scientific research into the twenty-first century. (Auth. mod.)

G-43808

Haugun, D., **Cold climate building research at Wasa Base, Antarctica**, International Cold Regions Engineering Specialty Conference, 6th, West Lebanon, NH, Feb. 26-28, 1991. Proceedings. Edited by D.S. Sodhi. Cold regions engineering, New York, American Society of Civil Engineers, 1991, p.272-281.

During the antarctic summer season of 1988-89 a permanent Swedish research station was erected in Dronning Maud Land. The station, named Wasa, is situated on a nunatak. A corresponding Finnish station named Aboa is situated 200 m from the Swedish base. The common name of the stations is Nordenskiöld Base. The nunatak, named "Basen", is the most northeastern spur of the Vestfjella range. Wasa's position is S74 35' and W11 13'. The building research project was conducted during the 1988-89 and 1989-90 expeditions. This paper gives details of the design and construction of Wasa Research Station, as well as the installation of data loggers and sensors. A general outline is also provided of the observations which were made during the 1989-90 expedition, i.e. one year after the completion of the station.

G-43809

Coleman, C.J., **Wind power in Antarctica: case histories of the North Wind HR3 wind turbine**, International Cold Regions Engineering Specialty Conference, 6th, West Lebanon, NH, Feb. 26-28, 1991. Proceedings. Edited by D.S. Sodhi. Cold regions engineering, New York, American Society of Civil Engineers, 1991, p.765-771.

Since 1985, Northern Power Systems wind systems have provided power to remote sites in Antarctica's harsh polar environment. The overall perspective provided by this experience is that wind power can effectively provide reliable electrical power and heat to the variety of loads needed to support the manned and unmanned stations in the Antarctic. The combination of extreme weather conditions and remoteness of the antarctic sites makes them even better suited for wind turbine installations, since the alternative power sources are more severely affected by these limitations than are wind-powered systems. This coupled with the vast wind energy resources on almost all sections of the continent, which range from moderate to extreme, make wind energy the most cost effective source of electrical power in Antarctica. (Auth. mod.)

G-43820

Rizos, C., Fu, W.X., Subsuentaeng, S., **Antarctic GPS surveying with the WM101 receiver: relative positioning using pseudo-range data**, *Australian journal of geodesy, photogrammetry and surveying*, June 1990 No.52, p.57-82, 8 refs.

Pseudo-range data collected by WM101 GPS receivers, during Jan. and Feb. 1989, have been analyzed by a variety of algorithms. It was intended to study the utility of single-frequency pseudo-range data for a variety of positioning applications, at accuracies higher than generally expected from GPS navigation, but lower than those of GPS surveying. The dataset consisted of 4 baselines, with lengths varying from about 20 m to over 170 km, between 4 static points in Antarctica. Several differential GPS algorithms, some originally devised for GPS navigation, others used in GPS surveying, were tested on the static baselines. The navigation algorithms are based on a Kalman filter, and implemented in a program called DYNAMO. The pseudo-range data was also processed through a conventional GPS surveying program called BASEL. The baseline lengths were derived from single point solutions, as well as from double-differenced data solutions. In all 4 processing strategies were tested. The best strategies for processing pseudo-range data resulted in the baseline length being derived to an accuracy of the order of 10-40 parts per million. (Auth.)

G-43851

Polish Academy of Sciences. Committee on Polar Research, **Removal of waste in Antarctica: report to the SCAR Group of Experts**, *Polish polar research*, 1990 11(1-2), p.173-205, In Polish with English abstract. 13 refs.

This document is presented by the Institute of Ecology of the Polish Academy of Sciences in response to a SCAR recommendation

to publish a report by the Antarctic Treaty Consultative Parties' countries, on their stations' activities and in their own language. This report gives a detailed outline of different types of waste generated at the antarctic stations, its disposal and monitoring, and the regulations governing those procedures resulting from international conferences on the subject. (Auth. mod.)

G-43919

Mae, S., **Activities of the wintering party of the 24th Japanese Antarctic Research Expedition in 1983-1984**, *Antarctic record*, Nov. 1990 34(3), p.363-380, In Japanese with English summary. 1 ref.

The wintering party of JARE-24 consisting of 35 participants carried out routine observations and research activities at Showa and Mizuho Stations, along the coast of Lützow-Holm Bay and in eastern Queen Maud Land, from Jan. 1983 to Jan. 1984. Activities at Showa were coordinated observations of the polar middle atmosphere and marine biological production, which were performed as part of the International Middle Atmosphere Program (MAP) and the Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS). In addition, survey trips for environmental research were carried out at short intervals along the coast of Lützow-Holm Bay. Glaciological studies were carried out as part of the International Antarctic Glaciological Project (IAGP), at Mizuho and along the traverse routes to the Sör Rondane Mountains in Queen Maud Land. The 411.1 m deep ice-core drilling was completed at Mizuho Station. (Auth. mod.)

G-43960

Kennedy, H., Voelker, R.P., St. John, J.W., **Design features and operation capability of the new US antarctic research vessel**, International Conference on Ice Technology, 2nd, Cambridge, England, Sep. 18-20, 1990. Proceedings. Edited by T.K.S. Murthy, J.G. Paren, W.M. Sackinger and P. Wadhams, Southampton, England, Computational Mechanics Publications, 1990, p.167-176, 1 ref.

A new research vessel with ice breaking capability has been designed and is currently under construction for long term charter to support the U.S. Antarctic Program. The program plan is for the vessel to operate in the Antarctic throughout the entire year as a marine research platform in regions around the antarctic continent. This paper describes the vessel, its mission profile, operational performance requirements and the environmental conditions it is likely to encounter. (Auth. mod.)

G-43961

Minnick, P.V., St. John, J.W., Voelker, R.P., Forhan, T., **Ramming icebreaking performance of the USCG polar class icebreakers**, International Conference on Ice Technology, 2nd, Cambridge, England, Sep. 18-20, 1990. Proceedings. Edited by T.K.S. Murthy, J.G. Paren, W.M. Sackinger and P. Wadhams, Southampton, England, Computational Mechanics Publications, 1990, p.283-294, 5 refs.

Ramming mode icebreaking tests were performed in the thick level ice of McMurdo Sound during Jan. 1989. The test objective was to collect an adequate set of full-scale data for the development of a mathematical model which could be used to predict an icebreaker's overall speed of advance while ramming. The tests were conducted with the U.S. Coast Guard icebreaker *Polar Sea* in level ice, ranging in thickness from 4 to 8 feet, with impact speeds of 1 to 9 knots. 91 ramming mode data points were obtained and correlated with the measured ice thickness and strength data. The method of analyzing the full-scale data is presented. (Auth. mod.)

G-44004

Baker, K.B., **Space physics in Antarctica: an adventure on the ice**, *Johns Hopkins APL technical digest*, 1990 11(3-4), p.228-238, 13 refs.

The Polar Anglo-American Conjugate Experiment is described, including details of the installation and operation of a PACE radar at Halley Station, and highlights of the journey by ship to and from Halley in the summer of 1987-1988. An introduction is given to the scientific results obtained from the PACE radars, demonstrating their capabilities. Their use in a variety of collaborative studies is noted, including the Geospace Environment Modeling project and pulsation studies in conjunction with instruments located at Amundsen-Scott Station.

G-44064

Turner, M.D., Splettstoesser, J.F., McClelland, J.J., Jr., **Antarctic logistic support for the earth sciences**, *American Geophysical Union. Antarctic research series*, 1990 Vol.51, Mineral resources potential of Antarctica. Edited by J.F. Splettstoesser and G.A.M. Dreschhoff, p.223-235, 35 refs.

This discussion of antarctic logistics deals primarily with the operations of the U.S. Antarctic Program. The program makes use of all aspects of logistics which are employed throughout the antarctic continent and surrounding oceans. In pursuing its research objectives, the U.S. program uses helicopters, Hercules (LC-130) ski-equipped aircraft, motor toboggans, tracked vehicles, hovercraft, research ships, and icebreakers. Large aircraft are universally used to transport personnel to and from Antarctica. Within Antarctica, the United States has also chosen to emphasize air transportation to carry scientific research to large parts of the continent. Antarctic conditions are closely comparable to those that will be encountered in future potential occupation and mining on the Moon and Mars. The U.S. approach to logistic support of Earth scientists has been remarkably successful in placing field parties of almost any size anywhere in Antarctica. These field parties have been able to work for periods of a few hours to an entire field season, with facilities and direct support that allow maximum time and effort for scientific research. Future efforts at commercial mineral evaluation and exploitation will need to look closely at the U.S. logistics effort as a possible pattern for their antarctic operations. (Auth. mod.)

G-44071

Orheim, O., **General report of the expedition**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.7-16.

Preliminary results of NARE 1989/90 are reported elsewhere in this volume. Nearly all programs on land were completed approximately as planned, while the marine programs, and especially the oceanography, achieved less than hoped for. The glaciologists drilled 400 m through the ice shelf, and deployed sub-ice instrumentation under thin shelf ice; they also conducted radio-echo soundings over Jutulstraumen, and measured the heat- and water balance of the snow at two locations. The ornithologists completed an extensive measuring program at the Svarthamaren SSSI, which consists of nearly 1 million antarctic petrels. NARE 1989/90 has demonstrated that it is possible to plan quite complex logistics using a combination of the K/V *Andenes*, medium-sized helicopters, bandwagons, and skidoos, and still allow the scientists to have their field season intact. The establishment of Station Troll was done with a crew of only two builders, who received help from the scientists in their spare time, and three drivers. The latter drove 3,000 km to bring building materials to the site. The station was built using extremely efficient coupling of the sandwich panels, with no screws or nails; the successful organization of transport was critical to maintaining the high building speed. (Auth. mod.)

G-44072

Haugland, J.E., **Building of the Station Troll, Norsk Polarinstitutt. Meddelelser**, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.17-20.

One of the main objectives for NARE 89/90 was the building of a permanent scientific research station in Dronning Maud Land. The station is 220 km from the barrier and 1270 m above sea level. It was placed on a frozen moraine area where snow should not accumulate. The station has a main building which is 96 sq m and an annex (generator house) which is 22 sq m. The station is designed and equipped for use by 8-10 persons for long periods. Some minor work remains before the station is suitable for year-round use, including a greater electrical supply. The building was put up in one month by the expedition participants, without the help of technical experts.

G-44266

Tilyou, M., Thayer, N., Zimmermann, R.P., **Polar class icebreaker oceanographic mission upgrade, Naval engineers journal**, May 1991 103(3), p.218-230, 7 refs.

The retirement in recent years of CGC *Glacier* and the last two Wind class icebreakers has left the Coast Guard with just two Polar class icebreakers to conduct missions in the Arctic and Antarctic. It has become clear in recent years that the research community needed enhanced scientific facilities available on board the two remaining Coast Guard icebreakers. After conducting a survey of the polar research community and holding a series of meetings with users of the vessels to ascertain the needs of the user community, the Coast Guard has undertaken to upgrade the research support capability of the two existing Polar class vessels. Improved research support capabilities were designed with ongoing consultation with the polar research community. The upgrade of facilities on the two vessels was divided into two phases: Phase I, an upgrade of geological facilities and Phase II, an upgrade of the general oceanographic facilities. This paper focuses on the design work for the Phase II upgrades on CGC *Polar Sea* consisting of construction of oceanographic and geological lab spaces, construction of a new oceanographic winch room, the addition of over-the-side weight handling equipment, the addition of topside support services for scientific vans, and the acquisition of new science winches. (Auth. mod.)

G-44277

Suitz, T., **Very short pulse C-band radar for crevasse detection**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.103-107, 3 refs.

A very short pulse C-band radar system to detect hidden crevasses in Antarctica has been developed. The characteristics of the new radar system are shown. A preliminary experiment to measure the distances of four targets made of plywood board was done in a laboratory to confirm the fundamental characteristics of the radar. Another preliminary experiment to detect the walls of a pit dug in a snow pile was performed by the radar to determine the usefulness of this radar for crevasse detection. (Auth.)

G-44286

Kornilov, N.A., Kozlovskii, A.M., **Use of different types of vessels in Soviet antarctic expeditions and their supply of hydrometeorological information** [Ispol'zovanie transportnykh sudov razlichnikh tipov v SAE i ikh gidrometeorologicheskoe obespechenie], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.114, p.36-40, In Russian.

The distribution of information on weather and ice conditions to various SAE cargo ships, carried out over the years from Molodezh-

naya, Bellingshausen and Leningradskaya Stations—equipped to receive satellite information—is reviewed. Ships serviced are listed by name, and their dimensions, speed and other characteristics, as well as their equipment and facilities to transport and deliver cargo in antarctic waters, are individually described.

G-44287

Kornilov, N.A., Kozlovskii, A.M., **SAE cargo operations using icebergs** [Provedenie gruzovykh operatsii SAE s ispol'zovaniem aisbergov], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.114, p.40-44, In Russian.

The use of icebergs for delivering cargo from ship to station in areas where the ice barrier itself is not accessible is discussed. The types of operations possible by the use of icebergs are outlined. Specifications regarding the iceberg's morphological features, thickness, length, height and other characteristics required for a successful unloading are provided. An illustration shows 3 differently shaped icebergs on the surface of which unloading operations were carried out by SAE ships. Another feature considered is one of the great dangers to the ship during such operations: iceberg drift, or the approach of another iceberg threatening collision, as happened during the unloading of SAE 31 in the vicinity of Leningradskaya Station. The way to deal with such situations is discussed.

G-44289

Ivanov, A.L., **Experimental studies of COSPAS-SARSAT in the Antarctic** [Eksperimental'noe issledovanie sistemy KOSPAS-SARSAT v Antarktike], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.114, p.51-55, In Russian. 3 refs.

Experiments are described carried out on the ship *Professor Vize*, cruising along the antarctic coast, to assess the viability of using the COSPAS-SARSAT systems for ship-to-shore emergency information transmission. Results show 2-6 hour delays in the information transmission through the system studied, making it unsuitable for antarctic operations. Some suggestions to increase the system's effectiveness are made.

G-44302

Blaisdell, G.L., **Personnel and cargo transport in Antarctica; analysis of current U.S. transport system**, *U.S. Army Cold Regions Research and Engineering Laboratory. Report*, CR 91-05, Mar. 1991 63p., ADA-236 142, 5 refs.

An analysis of the National Science Foundation's surface vehicle fleet in Antarctica is reported on here. Surface vehicle needs have been determined through interviews of vehicle users, managers and maintainers, and from direct on-site observation. An ideal grouping of vehicle categories is proposed that will address current needs and provide flexibility for the future. Recommendations for streamlining and modernizing the NSF antarctic vehicle fleet are made. Cargo transportation over snow was identified as being in a crisis state. Personnel movement functions for all but traversing are performed adequately at this time, although there is much room for improvement. Brands and models must be selected for some categories of recommended vehicle types. This will naturally follow a more in-depth analysis of candidates and discussions with NSF vehicle managers. A purchasing plan, including a timetable, budget, and desired sequence of replacement, must then be formulated and executed. (Auth.)

G-44349

Kim, D.W., **Construction report on Sejong Station**, *Korean journal of polar research*, Dec. 1990 1(2), p.51-67, In Korean with English summary.

The Korean Antarctic Expedition party landed on King George I. in Dec. 1985 and selected the site for King Sejong Station after meticulous land and aerial surveys. The final selection of the site was based on the following advantages: the average annual temperature is relatively high, -5 C in winter; the landing on the adjacent pier is facilitated by minimum amounts of drifting ice in the area; there is abundance of water, and easy information exchange with 7 other bases in the vicinity. The construction began in 1987 and was completed, with many difficulties, in 400 days, one of the drawbacks being the presence of irregular high winds. Design, construction operations, and equipment used and installed are described in detail.

G-44547

Barthelemy, J.L., **Thirty-five years of sea-ice runway operation—McMurdo Station, Antarctica**, IAHR Symposium on Ice, 10th, Espoo, Finland, Aug. 20-23, 1990. Proceedings, Vol.2, [1990], p.864-877, 5 refs.

As heavier aircraft are introduced to Antarctica, the Naval Civil Engineering Laboratory provides criteria for safe operation in terms of required ice thickness and period of operation. Improved analytical tools and computing ability have enabled NCEL to develop more refined load curves for landing and parking aircraft on ice. The finite-element computer program VISICE predicts both the elastic ("landing") and linear visco-elastic ("parking") responses of a floating ice sheet to loads applied to the surface. Material properties are built in as a function of temperature. In addition, a library subroutine of common aircraft allows the user to specify a craft by name and percent of maximum load only. Superposition of all wheel loads is provided automatically. Program VISICE was used as history was made during the unprecedented landing of a fully-loaded C5B Galaxy at McMurdo Station in Oct. 1989. (Auth. mod.)

G-44638

Mellor, M., Barthelemy, J.L., Fitzsimmons, G.J., Haehnle, R.J., Weeks, W.F., **Ice wharf enquiry. Report of the NSF task force**, MP 2945, Washington, D.C., Division of Polar Programs, National Science Foundation, June 1991, 18p. + Attachments 1-23 separately bound, Refs. passim. For papers included as some of the attachments, see 26-3532, 32-296, 32-1631, 38-278, 38-2176, and 44-829, or 9G-18892, 10G-19487, 13G-28590, 14G-29316, or 17F-40759.

This is the report of a task force appointed by the National Science Foundation to investigate the occurrence of two major cracks which caused the ice wharf at McMurdo Station to break into three large fragments on Feb. 13, 1991. The cargo ship *Green Wave* had just been unloaded and all personnel and material were removed before the breakup. Previous ice wharves were built in 1973, 1976 and 1983, and the present one in Mar.-Sep. 1990, by pumping sea water over the surface and letting the water freeze. It is suggested that the cause of the cracks was most probably flexural failure induced by long-wave swells of about 200 m. Other suggested causes such as concentrated vertical loads from empty shipping containers, ship impact, or bending moments from ship mooring lines, do not seem to have been strong enough in this case. An initial average ice thickness of 20 ft rather than 11 ft and two layers of reinforcing cables rather than one are recommended for future ice wharves.

G-44684

Drewry, D., **New vessel for the British Antarctic Survey**, *Shipping world & shipbuilder*, Oct. 1990 190(4067), p.332-334.

In Mar. 1989, the Natural Environment Research Council, on behalf of the British Antarctic Survey, signed a contract with Swan Hunter Shipbuilders of Wallsend, Newcastle-upon-Tyne, for the construction of a new antarctic logistics support and marine research vessel, to be delivered in May 1991. The ship was to be called 'RRS James Clark Ross' after the influential British polar explorer who in

1831 discovered the North Magnetic Pole; during voyages to Antarctica in the years 1841 to 1843, he also located the Ross Sea, Ross Island, the Ross Ice Shelf, Victoria Land and the James Ross Island Group. This note presents a brief description of the ship's structural features and research capacities, and outlines its basic oceanographic mission. (Auth. mod.)

G-44685

Incoll, P., **Development of Australian antarctic building types**, International Offshore and Polar Engineering Conference, First, Edinburgh, United Kingdom, Aug. 11-16, 1991. Proceedings, Vol.2. Edited by M.S. Triantafyllou et al, Golden, CO, International Society of Offshore and Polar Engineers, 1991, p.434-442, 4 refs.

In this article the main building types used by Australia in Antarctica are described, including circumstances and needs governing the design, a technical description, experience in use, and comments on strengths and weaknesses of the designs. Current directions of development are provided as a conclusion. (Auth. mod.)

G-44718

Smith, D., **Stargazing at the South Pole**, *New scientist*, June 22, 1991 130(1774), p.33-36.

A review is given of the development since 1970 of the South Pole as an astrophysical observatory. Martin Pomerantz has been a strong advocate of the location because of its remoteness, its miniscule population, its lack of precipitation, and the clarity and quietude of its atmosphere. Astronomers and astrophysicists throughout the world, convinced of the matchless suitability of the site, have begun establishing programs in solar physics, radio telescopes, and cosmic ray physics, and developing instrumentation to foster these programs. National and university support for additional projects is being expanded.

See also:

A-43739 A-44164 A-44199 A-44845 A-44863 B-42894
D-43783 D-44218 E-43921 F-43114 F-43258 F-43260 F-43263
F-43264 F-44550 F-44686 I-43240 I-43338 I-43384 I-44025
I-44265 I-44290 I-44293 J-43309 K-43752 K-45045 L-43292
L-43607 L-44892

H. MEDICAL SCIENCES

H-43012

Taylor, A.J.W., **Collection and transmission of behavioural data by computer and satellite**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.355-359, 12 refs.

A new biomedical data gathering technique is presented in which regular returns can be obtained from subjects in geographical isolation. It involves the conversion of reaction time and cognitive tests, and pertinent individual and social questionnaires, for computer administration. It requires their transmission by satellite in a coded form that will preserve confidentiality. The procedure promises to facilitate better monitoring of subject and group performance than previously has been possible. (Auth.)

H-43013

Palinkas, L.A., Gunderson, E.K.E., Burr, R.G., **Psychophysiological correlates of human adaptation in Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.360-371, Refs. p.370-371.

This study examines the social, psychological, and environmental correlates of the psychophysiological symptoms associated with wintering-over in Antarctica, and the extent to which these correlates can be used to predict the severity of symptomatology during the winter-over period. Subjects were 513 U.S. Navy enlisted men and civilian scientists and technicians assigned to 6 small U.S. antarctic research stations between 1964 and 1974. Station latitude, altitude and mean annual temperature were associated with depression and insomnia at the beginning of winter, and depression, hostility, and anxiety at the end of the winter. Environmental severity was an independent predictor of hostility and anxiety at the end of winter. Except for insomnia, however, the more severe the environment, the less severe the symptoms. Military and civilian personnel differed with respect to the symptoms experienced and the personality traits enabling them to adjust to the prolonged isolation and extreme environmental conditions. (Auth. mod.)

H-43014

Xue, Q., **Changes of cardiac and respiratory function of antarctic research expedition members in the Antarctic**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.372-375, 1 ref.

To determine human physiological changes in the 4th Chinese Antarctic Research Expedition members, cardiac and respiratory functions were evaluated in 22 men staying at the Great Wall Station from Nov. 1987 to Mar. 1988, at 3, 20 and 90 days after their arrival in Antarctica. An NCCOM-3 cardiac function estimating system was used, showing a cardiac output compensatory increase at 3 days, which was followed by a decrease. Pulmonary ventilatory function remained unchanged. Cardiac and respiratory function was also estimated in 16 members of the 3rd Antarctic Research Expedition before and after a 3 month stay in Antarctica in 1986-1987. No significant change was found in the ECG or the pulmonary ventilatory function. Results indicate that a physiological compensation of cardiac function may occur. No significant changes of the function of autonomic nervous system and nyctohemeral rhythm of body temperature were found. (Auth. mod.)

H-43167

Reed, H.L., **Decreased free fraction of thyroid hormones after prolonged antarctic residence**, *Journal of applied physiology*, Oct. 1990 69(4), p.1467-1472, 38 refs.

Humans who live in the polar regions of the globe are exposed to extremes of low temperature, low relative humidity, increased electromagnetic radiation, changing photoperiods, and social isolation. Changes in physiology associated with prolonged circumpolar residence may increase the understanding of the reported human responses to midlatitude winters. The purpose of this study was to measure the role of antarctic residence (AR) in modifying hormonal and physiological responses to cold air. To carry out the objective, changes were measured in the dialyzable fraction of thyroid hormones and the thermal and cardiovascular characteristics associated with 1) an experimental 60-min standard cold (0 C) air test (SCAT) and 2) the interaction of the SCAT with 24 and 44 wk AR.

H-43225

Palinkas, L.A., Gunderson, E.K.E., Burr, R., **Social, psychological, and environmental influences on health and well-being of antarctic winter-over personnel**, *Antarctic journal of the United States*, 1989 24(5), p.207-209, 6 refs.

This paper examines the social, psychological, and environmental correlates of the psychophysiological symptoms associated with wintering-over in Antarctica and the extent to which these correlates can be used to predict the severity of symptomatology during the winter-over period. Subjects were 513 U.S. Navy enlisted men and civilian scientists and technicians assigned to six small U.S. antarctic research stations between 1964 and 1974. Measures of depression, insomnia, hostility, and anxiety were elicited at the beginning and end of the winter-over period. Environmental severity contributed significantly to the prediction of hostility and anxiety; however, the more severe the environment, the less severe the symptoms. Military status predicted for insomnia. A low need to be controlled by others predicted for depression. A high need for autonomy predicted for hostility. A high score on the need to express affection and a low need for affection from others contributed significantly to the prediction of anxiety.

H-43226

Palinkas, L.A., Petterson, J.S., Gunderson, E.K.E., **Adaptive responses and resources of U.S. Antarctic Program military and civilian personnel**, *Antarctic journal of the United States*, 1989 24(5), p.210-212, 15 refs.

Forty-seven civilian and 28 military winter-over personnel who deployed to Antarctica during the 1988-1989 season were studied to determine if military and civilian personnel differ with respect to 2 sets of coping responses and resources known to moderate the association between stressful life events and illness: social support networks and individual personality traits and coping styles. Preliminary data indicate that military and civilian personnel differ with respect to their age and education, physical health status, and the experience of stressful life events. Civilians exhibited significantly more physical symptoms and experienced more negative life events prior to wintering-over, which should place them at greater risk for stress-related symptomatology than the military personnel. The analysis of stress-coping responses and resources revealed that civilian personnel are more likely to utilize active cognitive coping responses in handling stressful life events than military personnel. Navy subjects, on the other hand, may have a stronger internal locus of control than civilians.

H-43421

Nicholas, J.M., Foushee, H.C., **Organization, selection, and training of crews for extended spaceflight: findings from analogs and implications**, *Journal of spacecraft and rockets*, Sep.-Oct. 1990 27(5), p.451-456, 39 refs.

Ample research evidence from space analogs, such as the antarctic bases, points to the crucial role that teamwork plays in the performance of small groups in isolation and confinement. This paper surveys findings, many obtained in Antarctica, about the impacts of group behavior and social interaction on crew morale, coordination, and productivity. Implications for the organization, selection, and training of crews for extended spaceflight are discussed. (Auth. mod.)

H-43422

Kanas, N., **Psychological, psychiatric, and interpersonal aspects of long-duration space missions**, *Journal of spacecraft and rockets*, Sep.-Oct. 1990 27(5), p.457-463, 62 refs.

Through an analysis of reports from manned American and Soviet space missions and Earth-bound simulations—examples of such missions include antarctic expeditions—several psychological, psychiatric, and interpersonal issues can be identified that could affect the success of the space station and other long-duration space ventures. Psychological issues include sleep problems, alteration in time sense, demographic effects, career motivation, transcendent experiences, homesickness, and alteration in perceptual sensitivities. Psychiatric issues include anxiety, depression, and psychosis, psychosomatic symptoms, emotional problems related to the stage of the mission, and postflight personality changes. Interpersonal issues include interpersonal tension, decreased cohesiveness over time, need for privacy, and task vs. emotional leadership. Steps can be taken to minimize the impact of these issues, both before and during the mission. (Auth. mod.)

H-43423

Palinkas, L.A., **Psychosocial effects of adjustment in Antarctica: lessons for long-duration spaceflight**, *Journal of spacecraft and rockets*, Sep.-Oct. 1990 27(5), p.471-477, 41 refs.

This paper examines the utility of remote, isolated antarctic research stations as analogs for long-duration spaceflights from the perspective of psychosocial processes of adaptation and adjustment. Certain features of the physical and man-made environments found in Antarctica are similar to those that will be encountered in outer space. In both settings, men and women are likely to experience a number of physiological and psychological changes in response to the extreme environmental conditions and the prolonged isolation and confinement. Biomedical research in Antarctica provides an opportunity to study the causes of these changes and to develop strategies for reducing the risks to health and well-being before they pose a serious threat to crew safety and mission success. A number of lessons for long-duration spaceflight are examined, including screening and selection of personnel; training programs designed to facilitate individual adjustment and group adaptation and minimize group conflict; identification of optimal leadership characteristics for small, isolated groups; an understanding of social dynamics and group "microcultures" necessary for the organization and management of small but heterogeneous groups; organization of work activities; facility design; and support infrastructure. (Auth.)

H-43873

Klopov, V.P., Dmitriev, A.V., Kolmakov, V.N., **Evaluation of the influence of antarctic geomagnetism on human physiology in winter** [Otsenka vliianiia geomagnitnoi obstanovki Antarktity na organizm poliarnikov], *Antarktika; doklady komissii*, 1990 No.29, p.184-187, In Russian with English summary. 4 refs.

Studies of antarctic geophysical factors influencing the function of wintering-over personnel, carried out during the 32nd Soviet Antarctic Expedition, are discussed. The reaction of the recognition of erythrocyte membrane permeability (EMP) was used as a marker of the organism's condition. The eventual increase of EMP indicates the intense tension of cellular homeostasis. The depressive influence of high geomagnetic activity on the functioning of the cell membrane apparatus of the organism is established. Reaction of EMP is recommended for carrying out an examination of the functional state of antarctic wintering-over personnel. (Auth. mod.)

H-43874

Biziuk, A.P., **Some results, problems and prospects of psychological studies in Antarctica** [Nekotorye itogi, problemy i perspektivy psikhologicheskikh issledovanii v Antarktide], *Antarktika; doklady komissii*, 1990 No.29, p.187-193, In Russian with English summary. 19 refs.

Studies of psychological adaptation of participants in wintering-over expeditions to Antarctica are reviewed. Main emphasis is given to the types of adaptation changes from factor analysis of different aspects of interrelations between man and the extreme natural, and unusual socio-psychological, conditions. Some considerations concerning the organization of medical services in polar expeditions are presented. (Auth. mod.)

H-44005

Midwinter, M.J., Arendt, J., **Adaptation of the melatonin rhythm in human subjects following night-shift work in Antarctica**, *Neuroscience letters*, 1991 122(2), p.195-198, 16 refs.

Different environmental conditions, particularly daylength and intensity of natural light, may influence the ability of shiftworkers to adapt to the abrupt phase-shifts of 24 h time cues imposed by the nature of their work. This problem was investigated in terms of the circadian rhythm of the pineal hormone melatonin in nightshift workers at Halley Station. The acrophase of the melatonin rhythm was significantly delayed from 5.22 h.min to 14.54 h.min (summer) and 8.73 h.min to 13.23 h.min (winter) during a week of night-shift work. Readaptation of the rhythm following night-shift work was markedly slower during the antarctic winter, taking 3 weeks compared to summer where the baseline phase position was re-established after 1 week. Morning and evening treatment (08.00-09.00 h, 16.00-17.00 h) with bright (>2500 lux) full spectrum white light did not significantly modify this phenomenon in summer, but a trend to faster adaptation with light treatment was seen in winter. These observations are likely to be of importance to shift-workers in temperate zones. Further investigations of phase-shifting techniques, such as appropriately timed bright light and administration of melatonin itself, are indicated, particularly in relation to performance at work. (Auth. mod.)

H-44085

Molvaer, O.I., Bendiksen, F.S., Reitehaug, P.I., **Medical contingency and biomedical research**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.113-123, 1 ref.

The medical team reports its activities during the course of the NARE 1989/90 expedition. Since expedition projects were not con-

centrated in a single area but ranged 50-100 miles from Troll Station, the medical contingent became circuit riders, arranging its schedule to visit the various field parties. An outline of the medical effort includes team composition; treatment provided, by category; immunological studies involving the taking of blood samples at set intervals for later analysis and interpretation; observations of coping with stress; a cold adaptation study; and a cold fatigue and performance study.

H-44237

Shult, P.A., **Adenovirus 21 infection in an isolated antarctic station: transmission of the virus and susceptibility of the population**, *American journal of epidemiology*, Mar. 15, 1991 133(6), p.599-607, 33 refs.

Natural dissemination of viral respiratory illness to susceptible men may occur with surprising difficulty. This was especially evident during a 1977 outbreak of adenovirus type 21 (Ad-21) at McMurdo Station. The unique circumstances at McMurdo allowed 125 men from the US to join and intermingle with 75 men who had wintered for 6 months in complete isolation. For an additional 5-week (Sep. 2 to Oct. 4, 1977) isolation period, respiratory illness etiology and transmission were monitored in the combined population. A total of 89% of the population was susceptible to Ad-21 but only 15.0% were infected. Illness spread very slowly (1.5 cases/100 persons/week) with no epidemic peak and was much less severe than Ad-21 outbreaks in other settings. The incidence of infection (17.3%) and illness (9.6%) was low even in men who had wintered over, with values very similar to those of the newcomers (13.9% and 8.9%, respectively). Thus, despite a harsh environment and frequent prolonged gatherings of susceptible personnel, even a respiratory virus type with known epidemic potential was surprisingly difficult to transmit. (Auth.)

H-44350

Chang, S.K., **Report on the health and social adaptation of the wintering members of the First Korea Antarctic Research Program**, *Korean journal of polar research*, Dec. 1990 1(2), p.69-73, In Korean with English summary.

The report describes the questionnaire survey on the health history and social adaptation of overwintering personnel at King Sejong Station, Feb. 1988 to Feb. 1989, carried out in Oct. 1989, 10 months after their return to Korea. It is found that balanced food supply, interpersonal relationships and recreational facilities at the station need to be improved, even though most subjects held a positive attitude toward spending another winter in Antarctica. Difficulties in adjusting to social and political changes were seen in some subjects upon their return home, although the problems were overcome in a few months.

H-44611

Kennaway, D.J., Van Dorp, C.F., **Free-running rhythms of melatonin, cortisol, electrolytes, and sleep in humans in Antarctica**, *American journal of physiology*, June 1991 260(6), p.R1137-R1144, 28 refs.

This study explored the effects of wintering on sleep, hormonal, and electrolyte rhythms in four human subjects living in a small antarctic base. Up to the last sunset sleep, 6-sulfatoxymelatonin, cortisol, sodium, and potassium rhythms were synchronized within the group and maintained a stable phase relationship with clock time. During the 126 days of winter, when there was no sunlight, the circadian rhythms of all measures free ran in each individual. For example, the free-running periods for the cortisol excretory rhythm were 24 h 29 min, 24 h 45 min, 25 h 7 min, and 25 h 14 min for subjects C, J, K, and G, respectively. The period lengths of C, J, and K were significantly different, whereas there was no significant difference between K and G. The phase relationships between each rhythm re-

mained constant in three out of the four subjects. Total daily output and rhythm amplitude for 6-sulfatoxymelatonin, potassium, and sodium remained constant during the entrained and free-running stages of the study. Significant changes in total daily cortisol excretion were observed during the year, with one subject producing less and two subjects more while the rhythms were free running. When the sun reappeared during spring, all rhythms again synchronized and entrained to the daylight. These results show that circadian rhythms can free-run, even when the subjects have knowledge of time; and, within a small communal group, individuals can maintain unique free-running periods. (Auth. mod.)

H-44881

Bridgman, S.A., **Peripheral cold acclimatization in antarctic scuba divers**, *Aviation, space, and environmental medicine*, Aug. 1991 62(8), p.733-738, 31 refs.

Peripheral acclimatization to cold in scuba divers stationed at Signy I. was investigated during a year in Antarctica. Five divers and five non-diver controls underwent monthly laboratory tests of index finger immersion in cold water for 30 min. Index finger pulp temperature and time of onset of cold-induced vasodilatation (CIVD) were measured. Pain was recorded with verbal and numerical psychophysical subjective pain ratings. No significant differences were found among the variables recorded from divers and non-divers. From a review of the literature, divers have responses typical of non-cold-adapted Caucasians. There is, therefore, no evidence that Signy divers peripherally acclimatized to cold. It is suggested that these findings occur because either the whole body cooling which divers undergo inhibits peripheral acclimatization, or because of insufficiently frequent or severe cold exposure while diving. (Auth. mod.)

H-44995

New Zealand. Department of Scientific and Industrial Research. Antarctic Division, **Antarctic first aid manual**, Christchurch, 1990, 67p.

In 22 sections advice is given for initial treatment of a wide variety of trauma, including accidents, EAR/CPR situations, bleeding and wounds, shock, cold injuries, burns, fractures, sprains, poisoning, wind chill, and eye and skin injuries. Also discussed are dental health, medications, injections, and various medical kits assembled for antarctic conditions.

See also:

A-44164 A-44863

I. METEOROLOGY

I-42895

Matsubara, K., Doi, M., Uekubo, T., Okada, K.,
Meteorological observations at Syowa Station in 1988 by the 29th Japanese Antarctic Research Expedition, *Antarctic record*, July 1990 34(2), p.175-215, In Japanese with English summary. 8 refs.

Results of meteorological observations at Showa Station, Feb. 1988-Jan. 1989, and ozone observations on board the icebreaker *Shirase*, Nov.-Dec. 1987, are summarized as follows: a large scale stratospheric sudden warming and an abrupt increase of total column ozone took place from the end of Aug. to early Sep. The number of monthly snowstorms was the lowest recorded at Showa Station since 1966. On Mar. 21, a cyclone developed over the sea north of the station with a wind speed of 49.9 m/s, the maximum recorded in Mar. A monthly mean sea level pressure of 1001.5 mb was the maximum recorded in June and the second highest for the total period of observation. (Auth. mod.)

I-42901

Bojkov, R.D., ed, Fabian, P., ed, **Ozone in the atmosphere**, Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Hampton, VA, A. DEEPAK Publishing, 1988, 822p.

DLC QC879.7.O947 1988

The Ozone Symposium 1988, held from Aug. 8 to 13 at the University of Göttingen (FRG), was the sixteenth quadrennial symposium organized by the International Ozone Commission and was by far the largest Ozone Symposium ever. Almost 500 scientists from 34 countries participated in this international event, which was preceded by a Workshop on Tropospheric Ozone held from Aug. 4 to 6, both at the University of Göttingen and at the Max-Planck Institut für Aeronomie. The Workshop demonstrated the increasing importance given to the studies of tropospheric ozone and its possible modification by human activities, a field that has been largely neglected in the past. The papers presented during the meetings covered the following topics: tropospheric ozone, polar ozone (more than 35 on aspect of the antarctic ozone), ozone observations (from ground and space), observations of relevant trace constituents, reaction kinetics, mesospheric ozone, chemical-radiative-dynamical models studies, and new observational techniques. In this volume are published nearly two hundred of the presented papers, all of which have passed an initial review process. (Auth. mod.)

I-42902

Gardiner, B.G., **Antarctic ozone depletion measured by balloon sondes at Halley Bay**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.1-4, 3 refs.

DLC QC879.7.O947 1988

Profiles from a series of balloon-borne ozonesonde ascents are used to chart the development of the antarctic ozone depletion over Halley Bay in the austral spring of 1987. Flights were launched in the unaffected winter period and continued until well after the end of the active phase. The vertical structure of the ozone layer is discussed, including the presence of stratification, which occurs at all stages of development. The onset of depletion in late Aug. is described, and features of the development phase are illustrated. The depletion process, though irregular throughout Sep., eventually culminates in the establishment of a deep minimum in ozone mixing ratio.

By mid-Oct., most of the ozone has been destroyed throughout a deep layer of the lower stratosphere. (Auth.)

I-42903

Krueger, A.J., **Antarctic and Arctic total ozone extreme minima**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.5-9, 7 refs.

DLC QC879.7.O947 1988

Total ozone in the antarctic ozone hole reached an unprecedented low value of 109 Dobson units, as measured with the Nimbus 7 TOMS instrument on Oct. 5, 1987 over the East Antarctic highlands. This extremely low amount appears to be the result of ozone destruction in the lower stratosphere by chlorine compounds. The continental-scale, month-duration ozone hole is preceded by smaller total ozone minima which live only for a few days. Short-lived total ozone minima as low as 165 DU also appear in the Arctic, primarily during fall and early winter. However, during the decade of TOMS observations, Arctic features the size, duration, and depth of the antarctic ozone hole were not found. (Auth.)

I-42904

Newman, P.A., Schoeberl, M.R., **Breakup of the Southern Hemisphere spring polar ozone and temperature minimums from 1979-1987**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.10-13, 8 refs.

DLC QC879.7.O947 1988

The date of the Southern Hemisphere (SH) polar ozone minimum breakup is diagnosed using National Meteorological Center (NMC) heights and temperatures in conjunction with Total Ozone Mapping Spectrometer (TOMS) data. Zonal mean gradients of 100mb NMC temperatures and TOMS total ozone are the parameters used. Typically, the polar total ozone and the lower stratosphere temperature minima disappear during Nov. The breakup dates indicate that Oct. polar total ozone amounts are clearly related to the Nov. breakup dates. High Oct. polar ozone correlates with an early breakup date (mid-Nov.), while low polar ozone correlates with a late breakup (early Dec). (Auth. mod.)

I-42905

Sekiguchi, Y., **Ozone and stratospheric temperature change in Antarctica correlated to the solar activity**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.14-17, 4 refs.

DLC QC879.7.O947 1988

Total ozone data obtained by ground-based Dobson spectrophotometer at Showa Station are analyzed together with the lower stratospheric temperature data at the same site. The data period is 22 years (1966-87), corresponding to the two sunspot cycles. Harmonic components of 22-year and 11-year period are major features of the power spectra of ozone and stratospheric temperature. The contribution of these components is estimated to exceed 30% of the temperature or ozone variance in the spring. The phase relation between the solar cycle and corresponding components of temperature or ozone variations are found to be compatible with that in the lag correlation

between these quantities. The phase relation between the sunspot cycle and ozone and the stratospheric temperature at Showa suggests the influence of solar activity not only on ozone but also on the atmospheric circulation. It is of note that the influence of the quasi-biennial oscillation is substantial in the ozone and temperature variations. (Auth. mod.)

I-42906

Kawahira, K., Hirooka, T., **Interannual variations of zonal mean temperature in the Southern Hemisphere stratosphere: a link to the antarctic ozone depletion**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.18-21, 18 refs.

DLC QC879.7.0947 1988

Interannual variations of the daily zonal mean temperature in the Southern Hemisphere stratosphere are analyzed for the years 1980-86 by using NMC data. It is found that the antarctic lower stratosphere tends to cool in nearly all months, more noticeably in winter and spring. From this evidence the possible interrelation between the temperature decline and the ozone depletion is discussed. (Auth.)

I-42907

Mankin, W.G., Coffey, M.T., **Airborne observations of chemical constituents in the antarctic winter stratosphere**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.22-25, 15 refs.

DLC QC879.7.0947 1988

Between 1979 and 1984, the Oct. mean ozone column at Halley Bay showed a progressive decrease amounting to about 50%; satellite data subsequently indicated that the depletion occurred over the entire antarctic continent. To investigate the source of this striking and potentially dangerous phenomenon, NASA, NOAA, NSF, and CMA organized and sponsored an airborne expedition to Antarctica: the Airborne Antarctic Ozone Expedition. Aircraft were based at Punta Arenas, Chile, from Aug. 15 to Sep. 29, 1987. In ten flights over Antarctica, operating an NCAR Fourier transform spectrometer, high resolution infrared spectra were obtained. As part of an extensive measurement program, remote measurements were made of a number of gaseous constituents; O₃, NO, NO₂, HNO₃, ClONO₂, HCl, and HF are discussed. (Auth. mod.)

I-42908

Chubachi, S., Kajiwara, R., Kondoh, K., **Total ozone by lunar Dobson observation at Syowa, Antarctica**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.26-27, 3 refs.

DLC QC879.7.0947 1988

The accuracy of the Dobson observation by focussed moon image at Showa is described. The total ozone values obtained by the Dobson moon observation at night are usually about 6% higher than the direct sun measurement of the day before or the day after the night moon measurement. The annual change of total ozone at Showa including polar night season can be shown during the period from Feb. 1982 to Jan. 1987. The difference in the monthly means of vertical profiles of ozone partial pressure between the period from 1966 to Jan. 1982 and from Feb. 1982 to Dec. 1986 is also shown. (Auth.)

I-42909

Komhyr, W.D., Oltmans, S.J., Grass, R.D., Franchois, P.R., Leonard, R.K., **Changes in total ozone and vertical distribution at South Pole, Antarctica, 1962-1987**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.28-31, 6 refs.

DLC QC879.7.0947 1988

Ozone profile measurements made at South Pole with Regener chemiluminescent ozonesondes in 1962-1965 and with ECC ozonesondes in 1967-1971 and 1986-1987 indicate a decrease in the magnitudes of the primary ozone maxima and an increase in the maxima altitudes with time, for all seasons. The most marked ozone reduction occurred in recent years during Oct. months. A record low ozone amount of 127 DU was observed at South Pole in early Oct. 1987. The 1986 and 1987 springtime ozone decreases at South Pole differed in magnitude as well as in the times of ozone recovery. (Auth.)

I-42910

Hofmann, D.J., Harder, J.W., **Comparison of antarctic ozone profiles during spring 1986 and 1987**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.32-36, 3 refs.

DLC QC879.7.0947 1988

Ozone and temperature profiles were measured in 50 balloon flights at McMurdo Station during the spring of 1987. Compared to similar data obtained in 1986, stratospheric temperatures were lower and the springtime antarctic ozone reduction was greater in magnitude, extended to higher altitude, and proceeded at a higher rate in 1987. The major cause of the reduction was an ozone sink in the 11-23 km region. Adiabatic vertical motions over 1-2 km intervals between 12 and 20 km with consequent ozone reductions were observed in association with the formation of nacreous clouds, indicating these to be rare events on a local scale, probably associated with mountain lee waves. (Auth.)

I-42911

Feister, U., Plessing, P., Gernandt, H., **Ozone soundings at the antarctic station Georg Forster (70 deg 46 min S, 11 deg 50 min E)**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.37-40, 7 refs.

DLC QC879.7.0947 1988

Since May 1985, regular ozone soundings have been carried out at the antarctic station Georg Forster. About 200 soundings were made between May 1985 and May 1988. An analysis of ozone and temperature profiles of the period Sep. to Feb. 1985/86 and 1986/87, has shown some peculiarities in their distribution. The strong ozone decrease at the end of Sep. is characterized by the development of a layer of very small ozone values between 100 and 25 hPa (16-25 km). This ozone minimum layer shifts to lower height levels at the end of Nov. Therefore, a secondary ozone maximum occurs in the lower stratosphere from the end of Sep. to Nov. Short-term warmings in Sep./Oct. are accompanied by increasing total ozone values and a downward shift of the minimum ozone layer. The weaker spring ozone minimum in 1986 as compared to 1985 can be explained by a different pattern of temperature waves in both years. (Auth.)

I-42912

Voskresenskiĭ, A.I., Nesterov, V.V., Sveshnikov, A.M., IURganov, L.N., Karol, I.L., Shalamianskiĭ, A.M., **Atmospheric ozone variations in spring-summer period according to the data of Soviet antarctic stations**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.41-44, 7 refs.

DLC QC879.7.O947 1988

Atmospheric ozone measurements conducted at 2 Soviet antarctic stations are presented. The longest series of total ozone content (TOC) is examined for Mirnyy observatory. The character of seasonal TOC variations is different at stations in the region of stratospheric vortex and at stations in the outlying regions. TOC at Mirnyy station in the period of 1979-1988 appears to demonstrate a continuous decrease with the maximum trend in spring and the minimum trend in summer. The period of spring anomaly, so-called "ozone hole" period, is characterized by very low values of TOC, e.g. at Novolazarevskaya Station TOC decreases to 150 DU. The largest changes of the ozone content were observed in the layers from 16 to 20 km. Possible reasons for the antarctic spring decrease of TOC are discussed. (Auth.)

I-42913

Wang, P.H., Ghazi, A., McCormick, M.P., **Radiative relaxation in the polar stratosphere: the role of ozone**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.45-48, 7 refs.

DLC QC879.7.O947 1988

Radiative relaxation processes of the thermal disturbances associated with planetary waves in the antarctic stratospheric polar region were studied by using satellite ozone measurements of the Stratospheric Aerosol and Gas Experiment (SAGE II) and the associated temperature data from the National Meteorological Center (NMC). (Auth.)

I-42914

De Zafra, R.L., Jaramillo, M., Barrett, J., Emmons, L.K., Solomon, P.M., Parrish, A., **Measurements of anomalous ClO concentrations in the spring stratosphere over McMurdo Station, 1986 and 1987, and consequences for ozone depletion**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.49-52, 12 refs.

DLC QC879.7.O947 1988

As much as 1.85 ppbv of ClO have been found in the antarctic spring vortex region, at about 20 km altitude, using a ground-based remote sensing mm-wave spectrometer. This is more than two orders of magnitude greater than normally present in this altitude range, and proves that highly anomalous chlorine chemistry, made possible by denitrification of the antarctic stratosphere, is responsible for the seasonal ozone hole. Measurements were made in both 1986 and 1987 and yield the diurnal behavior, long term behavior, and mixing ratio profile for ClO from about 17 to 45 km. Calculations show that the large concentration of ClO is enough to yield efficient closure of the chlorine catalytic cycle solely through the dimer formation mechanism proposed by other researchers. Resulting ozone depletion rates calculated for various altitudes agree well with ozone observations at McMurdo Station in 1987. (Auth.)

I-42915

Vupputuri, R.K.R., **2-D model simulations of anomalous spring variations of ozone, temperature and other minor trace constituents in the southern polar region**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.53-57, 16 refs.

DLC QC879.7.O947 1988

A 2-D time dependent Eulerian model which takes into account the major interaction between chemistry and dynamical transports in the stratosphere is used to simulate anomalous spring variations of ozone, temperature and other relevant minor constituents. Normal transport coefficients and standard chemistry have been altered to represent the anomalous dynamical and chemical conditions in the extremely cold lower spring stratosphere south of 65S. The results show that it is necessary to invoke both dynamical and chemical mechanisms in order to explain the observed rapid spring decline of total ozone in the southern polar region. (Auth. mod.)

I-42916

Jaramillo, M., De Zafra, R.L., Barrett, J., Emmons, L.K., Solomon, P.M., Parrish, A., **Stratospheric hydrogen cyanide measurements at McMurdo Station during the antarctic spring**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.58-60, 13 refs.

DLC QC879.7.O947 1988

Measurements of hydrogen cyanide (HCN) in the springtime antarctic stratosphere were carried out using ground-based mm-wave spectroscopy. A volume mixing ratio ranging from 35 to 95 pptv was found at 40 km, and a steeper decrease with altitude than that found at tropical latitudes. This result may be further evidence of substantial vertical subsidence of the antarctic winter stratosphere. (Auth. mod.)

I-42917

Molina, M.J., **Chemistry of some reactions believed to be important in ozone depletion over Antarctica**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.61-64, 17 refs.

DLC QC879.7.O947 1988

The rates and mechanisms of several reactions believed to be important for ozone depletion in the antarctic stratosphere have been studied in the laboratory, at temperatures around 200 K. Polar stratospheric clouds play a crucial role in this process; the results indicate that they provide an extremely efficient medium to promote the release of photolytically active chlorine from the main inert reservoirs of hydrogen chloride and chlorine nitrate. The chemistry and spectroscopy of the dimer of chlorine monoxide has also been studied. This species is most likely involved in an efficient catalytic ozone destruction cycle which does not require atomic oxygen. (Auth.)

I-42918

Sanders, R.W., Solomon, S., Carroll, M.A., Schmeltekopf, A.L., **Ground-based measurements of O₃, NO₂, OCIO, and BrO during the 1987 antarctic ozone depletion event**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.65-69, 12 refs.

DLC QC879.7.O947 1988

This paper is a summary of the principal results of ground-based visible and near-uv absorption spectroscopy from McMurdo Station as part of the National Ozone Expeditions (NOZE I and II) in austral spring of 1986 and 1987. The instruments used are 3/8 m, fixed-grating, crossed Czerny-Turner spectrographs, each with a 1024-element cooled diode array detector. The light source is either sunlight scattered from the zenith sky or, at night, direct moonlight. The data is analyzed by least-squares minimization fitting of laboratory spectra collected with the same instruments. Comparisons are made of the constituents noted in the title between morning twilight measurements, and differences are discussed. (Auth. mod.)

I-42919

Newell, R.E., Selkirk, H.B., **Possible causes of recent total ozone anomalies**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.80-84, 21 refs.

DLC QC879.7.O947 1988

Recent total ozone anomalies based on 1963-1979 normals are examined at 32 stations in the surface network. Excess negative anomalies in the 1980s are of two types: those associated with the antarctic ozone hole and anomalies primarily in middle latitudes. The latter reached a maximum in 1983-85 and are now reduced; the former persist. Changes in atmospheric trace constituents, possibly coupled with atmospheric circulation changes inducing warmer southern oceans in recent years, are thought to govern the antarctic changes. It is suggested that the middle latitude anomalies are associated with material which ascended into the upper stratosphere and mesosphere following the eruption of El Chichon in 1982; such material would enter the lower stratosphere with a seasonal and latitudinal dependence similar to that of Rh-102, Cd-109 and Pu-238 from high altitude nuclear debris injections. (Auth.)

I-42920

Komhyr, W.D., Oltmans, S.J., Franchois, P.R., Evans, W.F.J., Matthews, W.A., **Latitudinal distribution of ozone to 35 km altitude from ECC ozonesonde observations, 1985-1987**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.147-150, 4 refs.

DLC QC879.7.O947 1988

Electrochemical concentration cell (ECC) ozonesonde observations, made in recent years at nine stations whose locations range from the Arctic to Antarctica, have yielded a self-consistent ozone data base from which the latitudinal ozone distribution to 35 km altitude has been derived. Mean seasonal and annual ozonesonde profiles are presented, together with isopleths of ozone volume mixing ratios to 35 km altitude as a function of latitude. The data should be useful for comparison with model calculations of the global distribution of atmospheric ozone, for serving as a priori statistical information in deriving ozone vertical distributions from satellite and Umkehr observations, and for improving the satellite and Umkehr ozone inversion algorithms. (Auth.)

I-42921

Wellemeyer, C.G., Fleig, A.J., Bhartia, P.K., **Internal comparisons of SBUV and TOMS total ozone measurements**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.193-197, 6 refs.

DLC QC879.7.O947 1988

The time series of the difference between TOMS and SBUV is examined, using the difference of monthly zonal means of total ozone measured by each instrument. The calculation of total ozone from the off-nadir measurements of radiance from TOMS is the major difference in the total zone algorithms of SBUV and TOMS. When the central samples of the TOMS scan are averaged to provide coincidence with the field of view of the nadir viewing SBUV, no significant drift is seen over the majority of the globe. Small differences at high altitudes after 1984 appear to be associated with instrument problems in TOMS, reported to commence in Apr. 1984. When the time series of the difference of the nadir and extreme off-nadir total ozone measurements from TOMS is examined, a 2% drift is seen across the eight year data record, which is consistent with estimates of the long-term calibration error in TOMS. The areal comparison of the two types of measurements extends from 70N through 70S; observed differences are shown in tables. (Auth. mod.)

I-42922

London, J., Perliski, L.M., **Hemispheric differences in observed stratospheric ozone**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.211-213, 13 refs.

DLC QC879.7.O947 1988

Analyses are presented of the hemispheric differences of time and longitude variations of stratospheric ozone. The present study is based on 8 years (Jan. 1979-Dec. 1986) of ozone concentration data as derived from the Nimbus 7 SBUV measurements. The results are generally consistent with preliminary reported results based on earlier, limited data sets. During the winter season, Southern Hemisphere ozone mixing ratio values at 1 mb are considerably higher than those in the Northern Hemisphere. However, during summer, the values are about 15-20 percent lower. The amplitudes of the annual variation in the upper stratosphere are maxima at about 60N and 50S but the phases of the maxima are just six months apart (Dec. N/June S). At 10 mb the ozone mixing ratio is almost always higher in the Northern Hemisphere, particularly at subpolar latitudes. In the tropics, however, the sign of the hemispheric difference alternates from perihelion to aphelion. Hemispheric differences in ozone mixing ratio are shown in tables having an effective range from 65N through 65S. (Auth. mod.)

I-42923

Ogawa, T., Koike, M., Suzuki, K., **Observation of vertical ozone profiles with the EXOS-C backscattered UV spectrometer**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.214-217, 16 refs.

DLC QC879.7.O947 1988

The EXOS-C/"Ohzora" satellite carried an ultraviolet (UV) spectrometer to measure the Rayleigh scattering of solar UV radiation by the terrestrial atmosphere. The instrumentation and observation aboard the EXOS-C, as well as the data analysis, are described briefly. The intercomparison of the retrieved ozone profiles with those from ground-based and balloon-borne observations shows an agreement within about 10%. The monthly-averaged meridional distribution of ozone mixing ratio is constructed. It exhibits a meridional distribution very similar to those from other satellite observations, and agrees with them within about 10-15% below the height of 1 mb pressure level. The ozone mixing ratio at a fixed pressure level for the period of Mar. 1984-July 1987 indicates a trend, which is ascribed to the instrumental drift. This implies difficulty in calibrating the spectral sensitivity of a satellite-borne spectrometer against a long-term drift. The meridional distribution of these observations extends from 75N through 75S. (Auth. mod.)

I-42924

Hilsenrath, E., Chandra, S., **Satellite total ozone climatology covering 16 years**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.227-231, 15 refs.

DLC QC879.7.O947 1988

Satellite total ozone observations have been analyzed from both the BUUV on Nimbus-4 and SBUV on Nimbus-7. The two data sets show very similar seasonal variations at all latitudes with some exceptions. The total ozone Quasi-biennial Oscillation (QBO) is very apparent, with some indication of a 4 year component. The QBO maximum and minimum are best correlated with the West and East components of the QBO wind at 30 mb respectively. The extratropical phase shift in the ozone QBO first seen in the Nimbus-4 data appears similarly in the Nimbus-7 data. Total Ozone eddies and NMC temperatures in the lower stratosphere are also analyzed by month and latitude. The ozone eddies correlate well with the temperatures on a month-to-month basis and over the long term after the seasonal cycles were removed. These long term changes should be nearly independent of instrument drifts and therefore represent a real climatological change. The study area extends from 60N through 60S with certain aspects reaching 70S. (Auth. mod.)

I-42925

Schuster, G.S., Rood, R.B., Schoeberl, M.R., **Quasi-biennial and interannual variability in high resolution total ozone data (TOMS)**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.260-264, 13 refs.

DLC QC879.7.O947 1988

The high resolution total ozone data of the Nimbus 7 TOMS has been used to study the equatorial and extratropical QBO from 67N to 67S. Emphasis is placed on the Southern Hemisphere. The relationship of the equatorial QBO in zonal winds to the extratropical QBO in high latitude total ozone is investigated. The equatorial QBO periodicity is statistically significant in the Southern Hemisphere, and implies that there is a relation between equatorial and extraequatorial QBO signals. The relationship becomes weak poleward of 40S. (Auth.)

I-42926

Gerhardt, P., Poppe, D., Marenco, A., **Ozone, CO and NO_x distribution in the troposphere during STRATOZ III**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.467-470, 21 refs.

DLC QC879.7.O947 1988

The distributions of O₃, CO, and NO, measured between 0 and 12 km altitude and 67N-60S latitude during the STRATOZ III campaign in June 1984, are analyzed. Altogether 42 profiles were taken. The concentrations exhibit a considerable variability with altitude and latitude. Correlations between the O₃ and the CO distributions are discussed in connection with a chemical in situ production of tropospheric ozone. The results show that ozone distributions are considerably influenced by dynamic processes. (Auth.)

I-42927

Oltmans, S.J., Komhyr, W.D., Franchois, P.R., Matthews, W.A., **Tropospheric ozone: variations from surface and ECC ozonesonde observations**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.539-543, 23 refs.

DLC QC879.7.O947 1988

A self-consistent set of ozonesonde soundings from an eight station network stretching from 75N to 90S confirms that there is more ozone in the NH troposphere than in the SH. There is a very strong enhancement at mid-tropospheric levels in ozone at Samoa (14S) during the austral spring. This is also the period of enhanced tropospheric ozone over tropical South America and Africa. Fifteen years of surface measurements at the four Geophysical Monitoring for Climatic Change observatories show increasing ozone concentrations at the two NH sites (Barrow and Mauna Loa). At the two SH locations (Samoa and South Pole), ozone amounts have decreased dramatically (about 2.0%/yr) during the austral summer (DJF) which is also the time of the seasonal minimum. (Auth.)

I-42928

Chipperfield, M.P., Eckman, R.S., Gray, L.J., Haigh, J.D., Pyle, J.A., **On the two-dimensional modelling of the stratosphere**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.585-588, 18 refs.

DLC QC879.7.O947 1988

The role of 2-D models is discussed. We consider the formulation ('classical Eulerian' versus 'diabatic') and argue that the most important consideration is that the physics and chemistry be included consistently. Results are shown from a classical Eulerian model which agree well with observations. One area of poor agreement is the polar lower stratosphere. The implications for studies of the antarctic ozone hole and the future perturbed stratosphere are discussed. Finally, some calculations relevant to antarctic ozone depletion are presented. (Auth.)

I-42929

Hou, A.Y., Schneider, H.R., Ko, M.K.W., **Role of parameterized eddy mixing in modelling the stratospheric circulation and tracer distributions**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.589-592, 6 refs.

DLC QC879.7.O947 1988

The effects of parameterized quasigeostrophic eddy mixing on the zonally averaged circulation and tracer slopes are examined in the context of idealized and realistic models of the stratosphere. As a result of nonlinear advection of relative angular momentum, the effect of reduced eddy mixing in the stratosphere is to contract the meridional width of the residual circulation (thereby limiting its poleward transport) and to intensify the circulation locally, resulting in a steeper meridional tracer slope relative to the isentrope. This is characteristically different from the behavior of a geostrophic circulation, which is constrained to vanish as the eddy mixing tends to zero. Model simulations with a realistic solar heating cycle suggest that meridional contraction of the residual circulation resulting from weaker wave activities in the Southern Hemisphere can provide a simple explanation for the asymmetry in the observed column ozone maxima between the Northern and Southern polar springs. (Auth.)

I-42930

Schneider, H.R., Ko, M.K.W., **Effect of parameterized friction and eddy diffusion on ozone perturbation calculations in a 2-D model**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.593-596, 5 refs.

DLC QC879.7.O947 1988

A variety of ozone perturbation calculations was performed with a 2-D model of dynamics, radiation and chemistry. Interactive calculations with various values of friction and eddy diffusion are compared with each other and with offline calculations, where a predetermined streamfunction was used for the transport. A simplified HO_x ozone model is used and increased chemical ozone loss terms are simulated by increasing the water vapor content in the stratosphere. It is shown that the ratio of the perturbed to the unperturbed ozone amounts is remarkably insensitive to the parameters used. The radiative dynamical feedback is shown to have a relatively small effect, amounting to about one third compensation in local mixing ratio differences in the upper stratosphere and one tenth in the ozone column amounts. The results are interpreted with the aid of stationary linear models for the diabatic circulation. Figures provide ozone column amounts and Jan. ozone mixing ratios at latitudes ranging from 90N through 90S. (Auth. mod.)

I-42931

Shine, K.P., Rickaby, J.A., **Solar radiative heating due to absorption by ozone**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.597-600, 12 refs.

DLC QC879.7.O947 1988

The radiative heating due to the absorption of solar radiation by ozone is calculated, using recent measurements of the absorption cross-section of ozone and the extraterrestrial solar irradiance. It is shown that the difference between two sets of absorption cross-sections leads to only very minor changes in the heating rate; the effect of the temperature dependence of the cross-section is also shown to be small. The heating rates are compared with those calculated using two parameterizations. Differences in diurnally-averaged heating rate can exceed 1 K/day in the upper stratosphere. A new parameterization is derived which fits the more detailed calculations to within 0.1 K/day in diurnally-averaged heating rate over a wide range of conditions. This parameterization is shown to give a globally-averaged net heating rate in the upper stratosphere considerably closer to zero than earlier calculations. Graphic figures depict the solar radiative heating rate in a latitude/height cross-section extending from 90N through 90S. (Auth. mod.)

I-42932

Wang, W.C., Molnar, G., Schneider, H.R., Ko, M.K.W., **Effects of stratospheric changes due to CO₂ doubling on the climate of the troposphere**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.601-604, 7 refs.

DLC QC879.7.O947 1988

Increases in atmospheric CO₂ have a strong effect on the earth's radiative energy balance. The net effect of a CO₂ increase is a warming of the troposphere-surface system and a cooling of the stratosphere. Associated with the stratospheric cooling are increases in O₃. A study on the effects of stratospheric changes due to CO₂ increases on the tropospheric climate is presented. The study is based on a 2-D seasonal climate model which includes stratospheric levels. Dynamical heat fluxes and O₃ for the stratospheric levels are taken

from runs of an interactive stratospheric 2-D model. The results suggest that the combined effects of changes in dynamical heat fluxes and O₃ in the stratosphere decrease the tropospheric warming and increase the stratospheric cooling resulting directly from CO₂-induced radiative perturbation. The model includes data for the zone extending from 30S to 90S. (Auth.)

I-42933

Wuebbles, D.J., Kinnison, D.E., **Two-dimensional model study of past trends in global ozone**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.605-608, 24 refs.

DLC QC879.7.O947 1988

Emissions and atmospheric concentrations of several trace gases important to atmospheric chemistry are known to have increased substantially over recent decades. Solar flux variations and the atmospheric nuclear test series are also likely to have affected stratospheric ozone. In this study, the LLNL two-dimensional chemical-radiative-transport model of the troposphere and stratosphere has been applied to an analysis of the effects that these natural and anthropogenic influences may have had on global ozone concentrations over the last three decades. In general, model-determined species distributions and the derived ozone trends agree well with published analyses of land-based and satellite-based observations. Also, the total ozone and ozone distribution trends derived from CFC and other trace gas effects have a different response with latitude than the derived trends from solar flux variations, thus providing a "signature" for anthropogenic effects on ozone. The model domain used in this study extends from pole to pole. (Auth.)

I-42934

Rognerud, B., Isaksen, I.S.A., Stordal, F., **Model studies of stratospheric ozone depletion**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.609-612, 4 refs.

DLC QC879.7.O947 1988

Future effects on ozone depletion for different control strategies for fully halogenated CFCs and halons are studied in a 2-D model. Five scenarios which cover the range from no control to 90% reduction in future CFC are used. Of particular interest is the scenario based on the Montreal agreement for future CFC and halon reductions. The calculations are time dependent and are extended to 2035. The results indicate that the "Montreal" scenario could lead to substantial reductions in total column ozone in the next century. A shift to F-22 on the other hand could lead to a substantial reduction in the depletion, as F-22 has a much smaller ozone depletion potential than the fully halogenated CFCs. Bromine compounds released from man-made halons in the stratosphere could contribute noticeably to future ozone depletion (20% of total depletion). This depletion occurs predominantly in the lower stratosphere at high latitudes as a result of reactions between bromine and chlorine species. As there are large uncertainties connected to the chlorine/bromine chemistry in these regions, there is a possibility that the ozone depletion could be larger than calculated. Extended ozone depletion calculations are depicted in graphs which include the area from 80N to 80S. (Auth.)

I-42935

Yang, H., Tung, K.K., Olaguer, E.P., **Two-D model simulation of ozone climatology and year-to-year variations**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.613-616, 32 refs.

DLC QC879.7.O947 1988

Using a coupled 2-D model where all transport parameters are determined interactively from radiative transfer calculations using the observed NMC temperature input for the individual years in the period 1979-1986, the seasonal and year-to-year changes in the column ozone were simulated. Comparing the result with the zonally averaged data from TOMS, it was found that the earlier climatology based on the first four years of TOMS data is well simulated, including the timing, magnitude and location of the spring maxima, and also the weak ozone hole that appeared. The year-to-year changes in column ozone at high latitudes follow the Quasi-biennial Oscillation (QBO), as pointed out by several authors. This feature is also reproduced by the model. (Auth.)

I-42936

Rood, R.B., Kaye, J.A., Allen, D.J., Baker, W.E., Lamich, D.J., **Use of winds and temperatures from a stratospheric assimilation model in three-dimensional constituent transport studies**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.625-629, 9 refs.

DLC QC879.7.O947 1988

An assimilation model that incorporates stratospheric rawinsonde data, rocketsonde profiles, and satellite temperature soundings into a general circulation model at 6 hour time intervals has been developed at NASA/GSFC. The model extends from the ground to 0.4 mb. The assimilation model generates wind fields that are balanced with the mass field through the model dynamics and physics. Winds and temperatures from the assimilation model have been used in this 3-dimensional transport and chemistry model. Comparisons with results from stratospheric forecast models, and data derived from geostrophic winds, demonstrate significant improvement in attempts to simulate the time evolution of LIMS constituent fields (O₃, HNO₃, NO₂, H₂O). However, notable discrepancies remain between the observations and the simulations. In particular, the meridional transport in the planetary wave systems is overestimated. Accompanying figures for wind and chemistry data range from 90N through 90S. (Auth. mod.)

I-42937

Kinnison, D.E., Johnston, H., Wuebbles, D.J., **Sensitivity study of global ozone to NO_x emissions from aircraft**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.635-638, 12 refs.

DLC QC879.7.O947 1988

There recently has been renewed interest in the development of faster and more efficient aircraft for intercontinental passenger flights. Such aircraft would probably spend a large fraction of their flight time in the stratosphere, perhaps as high as 35 km. As a natural progression from studies that were done in the early 1970s, this study reinvestigates the sensitivity of stratospheric ozone to NO_x emissions based on current understanding of atmospheric chemical and physical processes. The LLNL one-dimensional and new two-dimensional chemical-radiative-transport models of the troposphere and stratosphere are used in this investigation. The two-dimensional model pro-

vides latitudinal, altitudinal, and seasonal resolution; and the computationally faster one-dimensional model is used for sensitivity studies. Because of uncertainties in possible future emissions, it is necessary to examine the model sensitivity to a wide range in magnitude, altitude, and latitude of assumed NO_x emissions. As an initial study, the models are used in simulation of a typical scenario from the CIAP era, and results are compared with those of a published two-dimensional model, which includes some three-dimensional features. This investigation lays the groundwork for future studies, including different background amounts of CIX and for other aircraft emission scenarios. The figures depict ozone latitudinal changes between 90N and 90S as a result of aircraft nitrogen emissions injected into the northern stratosphere. (Auth. mod.)

I-42938

Grant, K.E., Wuebbles, D.J., **Two-dimensional modeling study of the sensitivity of ozone to radiative flux uncertainties**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.639-642, 15 refs.

DLC QC879.7.O947 1988

Radiative processes strongly affect equilibrium trace gas concentrations both directly, through photolysis reactions, and indirectly through temperature and transport processes. The LLNL 2-D chemical-radiative-transport model is used to investigate the net sensitivity of equilibrium ozone concentrations to several changes in radiative forcing. Doubling CO₂ from 300 ppmv to 600 ppmv resulted in a temperature decrease of 5 K to 8 K in the middle stratosphere, along with an 8% to 16% increase in ozone in the same region. Replacing shortwave scattering algorithms with a simplified Rayleigh algorithm led to a 1% to 2% increase in ozone in the lower stratosphere. Finally, modifying normal CO₂ cooling rates by corrections derived from line-by-line calculations resulted in several regions of heating and cooling. Temperature changes on the order of 1 K to 1.5 K were observed with corresponding changes of 0.5% to 1.5% in O₃. The results for doubled CO₂ compare favorably with those by other authors; results of two perturbation scenarios stress the need for accurately modeling radiative processes while confirming the general validity of current models. The model domain for this study extends from pole to pole. (Auth.)

I-42939

Connell, P., Grant, K.E., Wuebbles, D.J., **Aspects of CFC relative ozone destruction efficiencies determined in the LLNL 2-D model**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.643-646, 6 refs.

DLC QC879.7.O947 1988

An investigation is made into the efficiency of surface emission of several individual chlorofluorocarbons (CFCs) and hydrogen-containing chlorofluorocarbons (HCFCs) for reducing the calculated steady state total ozone column in both one- and two-dimensional models, relative to the effects of CFC-11 (CFC13) emission. CFC and HCFC relative efficiencies can vary over two orders of magnitude, mostly as a result of atmospheric lifetimes. For CFCs and HCFCs with long stratospheric lifetimes the calculated efficiency is also reduced by the effects of lower and mid stratospheric photochemistry. Ozone in this region changes according to the net effect of changing rates of oxygen photolysis, direct chlorine-catalyzed ozone loss and interference by active chlorine species in the nitrogen oxide-catalyzed ozone loss process. In these cases, the relative efficiencies show a marked latitudinal dependence, being larger at high latitudes and smaller at lower latitudes. Additionally in these cases, the one-dimensional model result appears to overestimate the globally and annu-

ally averaged result that is obtained from the two-dimensional model. These considerations should be taken into account when quantities similar to the relative efficiency defined here are applied to CFC production and emission decisions. The model domain extends from pole to pole, but does not treat the heterogeneous processes currently thought to be of great importance in the antarctic ozone hole phenomenon. (Auth.)

I-42940

Jackman, C.H., Douglass, A.R., Newman, P.A., Guthrie, P.D., **Effect of computed horizontal diffusion coefficients on two-dimensional ozone assessment studies**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.647-650, 22 refs.

DLC QC879.7.O947 1988

The use of computed Kyy and Kyz (horizontal diffusion coefficients) values in the model compared to a base case using minimal Kyy and Kyz values showed several differences. Total ozone was increased at the polar latitudes and decreased at mid-latitudes with input of these Kyy and Kyz values; maximum changes were apparent in the high latitudes because of large variations in the values of Kyy in the lower stratosphere. Most other species including Clx, odd nitrogen, CH₄, N₂O, and the chlorofluorocarbons also showed an enhanced transport to higher latitudes, especially in the winter because of large Kyy values in the middle to upper stratosphere at higher latitudes. An ozone perturbation scenario was investigated in which Clx was increased from 2.5 ppbv to 8.2 ppbv, N₂O was increased by 20%, and CH₄ was doubled. The total amount of ozone depletion was about the same in the minimal horizontal diffusion model experiment compared to the computed horizontal diffusion model experiment; however, the latitude of maximum total ozone depletion was changed somewhat, especially in the middle to high latitudes. (Auth.)

I-42941

Douglass, A.R., Jackman, C.H., Stolarski, R.S., **Two-dimensional model comparisons of odd nitrogen family chemistry with separate calculations for the odd nitrogen species**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.651-654, 8 refs.

DLC QC879.7.O947 1988

Many two dimensional models with full chemistry are too slow to examine a large number of scenarios or sensitivities to the dynamical assumptions which are required in their development. Simplifying assumptions may be made in order to develop a faster model. Considered here are family chemistry approximations in which certain species are grouped together and transported as one species. These assumptions are tested by comparing results for the family transport model (FTM) with results for the separate transport model (STM). Two cases are considered: a current atmosphere annual cycle; and a typical scenario for increases in fluorocarbons, methane and nitrous oxide. Although there are differences in odd nitrogen species partitioning, especially at high latitudes, the calculated O₃ distributions are nearly identical. For the perturbation scenario, although the column ozone change is 0.5% less for STM than FTM, the major features of the distribution of ozone losses are reproduced. (Auth. mod.)

I-42942

Guthrie, P.D., Jackman, C.H., Kucsera, T.L., **On the latitude dependence of ozone depletion predictions**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.655-659, 11 refs.

DLC QC879.7.O947 1988

Assessments of the effects of chemical perturbations on the ozone column have now been carried out using a number of 2-D models. Until recently most such studies showed a characteristic variation of fractional depletion with latitude, having minimum depletion in the tropics with greater depletion at middle and high latitudes. Two studies have shown a "reversed" latitude gradient (maximum depletion in the tropics) when temperature and circulation feedbacks were included in the models, and a combined perturbation (increased chlorine and doubled CO₂) was imposed. Reported here is a series of studies with a model with coupled chemistry, temperature, and circulation which constrains the lower stratospheric circulation less than previous models. These studies indicate that models may produce a reversed gradient in ozone depletion for both a chlorine-only perturbation and the combined perturbation. (Auth.)

I-42943

Haigh, J.D., Pyle, J.A., **Radiative heating rates and the distribution of temperature and ozone in a two-dimensional model of the stratosphere**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.664-667, 14 refs.

DLC QC879.7.O947 1988

An assessment is made of some of the approximations made in the calculation of thermal infrared radiative cooling rates in the stratosphere. Large differences in cooling rates arise, and the effect of errors of such magnitude on temperature and ozone fields is studied using a two-dimensional model with full representation of photochemical and radiative processes. Serious uncertainties in modelled ozone and temperature are found for errors of order 1 K/d in cooling rate but uncertainties of order 1 K in temperature and 2% in ozone concentration for errors of order 0.1 K/d. An experiment in which the model dynamics are inhibited from responding to changes in temperature confirms the necessity for interactive transport-chemistry-radiation in ozone perturbation calculations. The model domain for temperature differences and change in O₃ extends from 60N to 90S. (Auth.)

I-42944

Kaye, J.A., Rood, R.B., Allen, D.J., **Variability of chlorine containing species as revealed by three-dimensional stratospheric transport and chemistry models**, Ozone in the atmosphere: Ozone Symposium 1988 and Tropospheric Ozone Workshop, Aug. 1988, Proceedings. Edited by R.D. Bojkov and P. Fabian, Hampton, VA, A. DEEPAK Publishing, 1989, p.676-679, 11 refs.

DLC QC879.7.O947 1988

A three-dimensional model of the combined effects of chemistry and transport in the Earth's stratosphere is described together with its application to the period of the Feb. 1979 major stratospheric warming. The model includes 12 transported constituents and/or families, including those containing odd oxygen, nitrogen, hydrogen, and chlorine, and is designed to simulate the time dependence of diurnally varying constituents and to correctly represent the behavior of constituents near the terminator. Results presented include the zonal mean concentrations of chlorine-containing species for conditions corresponding to local noon and local midnight, and latitude-longitude distributions of the chlorine-containing constituents at 10 mb. The way in which the non-zonal dynamics are reflected in the distribu-

tions of reservoir constituents is discussed. The model domain extends from pole to pole. (Auth.)

I-43019

Streten, N.A., **Australian studies in antarctic weather and climate**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.411-417.

The Antarctic Science Advisory Committee (ASAC), which has the responsibility of advising the Australian government on field and Australia-based research and monitoring programs in Antarctica, has identified 7 broad areas of scientific investigation including "Research into the role played by the antarctic in Australian and global weather and climate." In this context the research extends not only across the broad disciplines of meteorology and climatology but also into oceanography, glaciology, geochemistry and geomorphology. Research is pursued within the Australian Universities, the Commonwealth Scientific and Industrial Research Organization (CSIRO), the Bureau of Meteorology, and the Antarctic Division. Some of the programs carried out in these fields in recent years are listed. (Auth. mod.)

I-43021

Kawaguchi, S., **Monitoring of atmospheric minor constituents under the program of antarctic climate research**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.426-429, 13 refs.

Measurements of atmospheric CO₂ concentration are made continuously at Showa Station using a nondispersive infrared analyzer with a precision of ± 0.01 ppm. Preliminary results showed the 1988 average to be 348.9 ppmv. The atmospheric content of CH₄ is also measured continuously by the gas chromatographic method. Total ozone has been measured by Dobson spectrophotometer in 1961 and since 1966. The vertical profile of ozone has been measured by an electrochemical ozonesonde in about 30 flights per year. Long time trend of the total ozone revealed the marked decrease in the 1980s ozone hole. Spring time ozone in 1987 showed the lowest value of the total ozone, 153 DU in Oct. On board the research vessel *Shirase* during its cruise from Tokyo to Showa Station, several observations of minor constituents were carried out to obtain the meridional distribution. (Auth. mod.)

I-43022

Bian, L., Lu, L., Zhang, Y., **Temporal and spatial variation of temperature in antarctic region and its relations with the summer weather in China**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.430-438, 8 refs.

A preliminary analysis is made of the pattern of temperature variation in Antarctica and its relations with the general circulation of the Northern Hemisphere and the summer precipitation in China, by using the monthly temperature data of 20 antarctic stations from 1958 to 1983, the southern oscillation index for the same period, the upper air data in the Northern Hemisphere, and the temperature and precipitation data in China. The analysis shows that the quasi 3-year oscillation cycle of temperature variation in Antarctica coincides with that of the southern oscillation. Such an oscillation cycle is consistent with features of the Northern Hemisphere circulation and the main oscillation cycle of precipitation in China. It is noted that the higher summer temperatures in Antarctica bring more precipitation in North China and a lower temperature in northeast China in the summer of the following year. The reverse is also true. (Auth. mod.)

I-43023

Chen, L., Yang, X., Huang, J., **Air-sea exchange of sulfur, phosphorus, and nitrogen in marine aerosols over the antarctic peninsula waters**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.439-446, 16 refs.

Analysis of marine aerosol samples collected in the Pacific Ocean and in the atmosphere over water surrounding the Antarctic Peninsula suggests that their sodium and magnesium are derived from seawater. Contents of sulfur, phosphorus, and nitrogen are attributed to natural processes. Most of the nitrate found in the southern ocean aerosol shows uniform concentrations, which can be attributed to HNO₃ from lightning, through gas-particle transformation on the aerosol surface. Flux of nitrogen from air to the Antarctic Peninsula waters is 0.57 microgram N/sq m/y, providing a stable input of nitrate to seawater for marine life. Water soluble phosphorus was found in much higher concentrations in the Antarctic Peninsula aerosol, a flux of 0.12 microgram P/sq m/y to seawater. (Auth. mod.)

I-43024

Yamanouchi, T., Wada, M., Kawaguchi, S., **Distribution of cloud in the Antarctic from satellite and ground based observations under the program of Antarctic Climate Research**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.446-454, 9 refs.

Cloud-radiation climatology in the Antarctic has been studied extensively, and processing of Advanced Very High Resolution Radiometer (AVHRR) imagery was started in 1987 at Showa Station. Cloud distribution is analyzed from the AVHRR data using the brightness temperature differences of infrared channels and the 2 dimensional scatter diagram of brightness temperature and difference. Cloud covers obtained by the AVHRR data are compared to the cloud information obtained by surface cloud measurements and downward longwave radiation. Cloud amounts obtained by the brightness temperature difference of channels 3 and 4 in summer show good agreement with the manual cloud amounts at the surface, and highly correlate to the downward longwave fluxes. In winter, cloud amounts are obtained only by the temperature difference of channels 4 and 5 and also show a rough agreement. Cloud amounts are derived for 512 x 512 pixels area, and horizontal distributions of cloud are discussed. (Auth. mod.)

I-43025

Zhou, X., Bian, L., Jia, P., Lu, L., **Heat balance over the Great Wall Station, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.454-461, 7 refs.

During summer of 1987-1988, the first micrometeorological observations and experiments on the boundary layer were carried out over the Great Wall Station; the thermal status is calculated by using the theory of similarity. A marked daily variation in all the components of the summer surface thermal balance over the station is seen. The daily average net radiation value for snow-covered and uncovered land surfaces is estimated to be positive; over 75% of the net radiation is used by the surface in the process of snow melting and moisture evaporation. The sensible heat flux and the heat flux into the ground are not significant. It is found that in summer the land surface of the station area is a heat source for the atmosphere, while the inland area of Antarctica is a cold source. (Auth. mod.)

I-43026

Lu, L., Bian, L., Jia, P., **Characteristic analyses on the weather and climate of the Great Wall Station, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.462-472, 4 refs.

Meteorological data of 1985-1988 from the Great Wall Station show that the northern part of the Antarctic Peninsula, where the station is located, has a subpolar marine climate: high yearly mean temperature and large amounts of clouds and precipitation. The region is a sensitive area where the cold continental polar air mass meets with the subpolar, or mid-latitude, marine air mass. The strength and location of these air masses, the effect of the topography of the peninsula, and the thermal regime of the surface are the main causes for the station's weather and climate characteristics; 3 weather patterns dominate. The yearly input of radiation is greater than the output. The net radiation reaches its maximum value in the short summer, the minimum in winter. The heat surplus of the ground transfers to the atmosphere mainly by means of latent heat transport. (Auth. mod.)

I-43034

Gao, D., Jiang, D., **Preliminary study on the surface pressure oscillation in antarctic area**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.529-533, 10 refs.

The characteristics of the surface pressure and the temperature oscillations in 3 stations (Showa, Mizuho and Great Wall) have been studied by means of harmonic analysis. Results indicate that the mean diurnal surface pressure oscillation S1(P) is stronger than the semidiurnal component S2(P). This means that the S1(P) has not been suppressed and that S2(P) has not been enlarged in the antarctic area. The surface temperature oscillation usually has a larger semidiurnal amplitude S2(T) than that of diurnal oscillation S1(T) in winter. S2(T) larger than S1(T), accompanied by S1(P) larger than S2(P), suggests that the atmospheric tide cannot be explained simply in terms of thermal excitation theory. (Auth.)

I-43071

Brasseur, G.P., Granier, C., Walters, S., **Future changes in stratospheric ozone and the role of heterogeneous chemistry**, *Nature*, Dec. 13, 1990 348(6302), p.626-628, 20 refs.

Heterogeneous chemical reactions on the surfaces of solid or liquid particles present in the lower stratosphere may be an important influence on the levels of ozone depletion resulting from increased concentrations of anthropogenic chlorine compounds in the atmosphere. Such processes, occurring on ice particles in polar stratospheric clouds, have been invoked to explain the formation of the springtime ozone hole over Antarctica. Sulphuric acid aerosols injected into the atmosphere following a volcanic eruption may also provide sites for heterogeneous chemistry leading to ozone depletion. Here calculations are presented that assess the importance of heterogeneous processes in future ozone depletion, assuming that trace-gas concentrations follow the protocol agreed to at the recent international convention in London. It seems that even if this protocol is adhered to, reactions on the surface of sulphuric acid aerosol particles could produce significant ozone depletion into the beginning of the next century, especially if a major volcanic eruption takes place. (Auth.)

I-43072

Solomon, S., Tuck, A., Fisher, D.A., Ho, M., Wuebbles, D., Isaksen, I., **Evaluating ozone depletion potentials**, *Nature*, Nov. 15, 1990 348(6298), p.203-204, Includes reply by Fisher et al. 17 refs.

Solomon and Tuck take issue with Fisher *et al*, suggesting that they have considerably underestimated the ozone depletion potential of certain CFCs. Fisher *et al* respond on three specific points: the impact of heterogeneous chemistry; the chlorine delivered to the polar regions; and the effects of bromine chemistry on ODPs.

I-43077

Boden, T.A., Kanciruk, P., Farrell, M.P., **Trends '90: a compendium of data on global change**, Oak Ridge, TN, Oak Ridge National Laboratory, 1990, 257p. + appends., Refs. passim.

This document is a source of frequently used global change data. This first issue includes estimates for global and national CO₂ emissions from the burning of fossil fuels and from the production of cement, historical and modern records of atmospheric CO₂ and methane concentrations, and several long-term temperature records. Included are tabular and graphical presentations of the data, discussions of trends in the data, and references to publications that provide further information. Data are presented in a two-page format, each dealing with a different data set. All data are available in digital form from the Carbon Dioxide Information Analysis Center. Antarctic monitoring stations included in this compilation are South Pole, Amundsen-Scott, Halley Bay, Palmer, Vostok, Siple and Byrd Stations. (Auth. mod.)

I-43095

Thompson, L.G., Mulvaney, R., Peel, D.A., **Cooperative climatological-glaciological program in the Antarctic Peninsula**, *Antarctic journal of the United States*, 1989 24(5), p.69-70, 11 refs.

A cooperative glaciological-climatological ice-core drilling program among the British Antarctic Survey, Ohio State University, and the University of Washington was initiated during the 1988-1989 antarctic field season. The program will endeavor to establish from ice cores a 1,000- to 2,000-year paleoclimatic history for the southern Antarctic Peninsula region. One of the principal scientific objectives of the investigation is to determine the nature of the physical link between annually resolvable records from other ice cores in the Peninsula: Dolleman I. and Gomez Nunatak, James Ross I., and Siple Station in Antarctica, as well as more distant sites like the Quelccaya Ice Cap (14S). A more global synthesis of climatic variations over the last 2,000 years will increase the understanding of the mechanisms controlling the more frequent fluctuations within the global climate system, and help assess the degree to which the paleoclimatic records extracted from polar ice cores relate to climatic events in low latitudes.

I-43109

Ghan, S.J., Taylor, K.E., Penner, J.E., Erickson, D.J., III, **Model test of CCN-cloud albedo climate forcing**, *Geophysical research letters*, Apr. 1990 17(5), p.607-610, 18 refs.

Cloud condensation nuclei (CCN) influence cloud albedo through their effect on the cloud droplet size distribution. A number of studies have evaluated the climatic impact of the CCN-cloud albedo feedback, but all have assumed that cloud distributions, cloud thicknesses, and cloud liquid water contents would remain constant as the climate adjusted. This assumption was tested using the Livermore version of the National Center for Atmospheric Research (NCAR) Community Climate Model (CCM1). Results indicate that there are no significant compensating changes in cloud properties that would counteract the 1.7% global albedo increase resulting from a fourfold increase in marine CCN concentration. Furthermore, when ocean surface temperatures are decreased 4 C in a manner broadly consistent with the enhanced cloud albedos, an increase in cloud fraction of 3.5% and a reduction in cloud altitude are predicted, leading to a positive feedback from clouds that would imply a climate impact roughly double that calculated from cloud droplet size distribution change alone.

One of the accompanying figures is a graph of average fractional cloudiness and cloud liquid water path plotted as functions of SSTs and latitude extending from 85N to 85S. (Auth.)

I-43121

Anderson, J.G., Toohey, D.W., Brune, W.H., **Free radicals within the antarctic vortex: the role of CFCs in antarctic ozone loss**, *Science*, Jan. 4, 1991 251(4989), p.39-46, Numerous refs.

How strong is the case linking global release of chlorofluorocarbons to episodic disappearance of ozone from the antarctic stratosphere each austral spring? Three lines of evidence defining a link are: observed containment in the vortex of ClO concentrations two orders of magnitude greater than normal levels; *in situ* observations obtained during ten high-altitude aircraft flights into the vortex as the ozone hole was forming that show a decrease in ozone concentrations as ClO concentrations increased; and a comparison between observed ozone loss rates and those predicted with the use of absolute concentrations of ClO and BrO, the rate-limiting radicals in an array of proposed catalytic cycles. Recent advances in the understanding of the kinetics, photochemistry, and structural details of key intermediates in these catalytic cycles, as well as an improved absolute calibration for ClO and BrO concentrations at the temperatures and pressures encountered in the lower antarctic stratosphere, have been essential for defining the link. (Auth.)

I-43122

Schoeberl, M.R., Hartmann, D.L., **Dynamics of the stratospheric polar vortex and its relation to springtime ozone depletions**, *Science*, Jan. 4, 1991 251(4989), p.46-52, Numerous refs.

Dramatic springtime depletions of ozone in polar regions require that polar stratospheric air have a high degree of dynamical isolation and extremely cold temperatures necessary for the formation of polar stratospheric clouds. Both of these conditions are produced within the stratospheric winter polar vortex. Recent aircraft missions have provided new information about the structure of polar vortices during winter and their relation to polar ozone depletions. The aircraft data show that gradients of potential vorticity and the concentration of conservative trace species are large at the transition from mid-latitude to polar air. The presence of such sharp gradients at the boundary of polar air implies that the inward mixing of heat and constituents is strongly inhibited, and that the perturbed polar stratospheric chemistry associated with the ozone hole is isolated from the rest of the stratosphere until the vortex breaks up in late spring. The overall size of the polar vortex thus limits the maximum areal coverage of the annual polar ozone depletions. Because it appears that this limit has not been reached for the antarctic depletions, the possibility of future increases in the size of the antarctic ozone hole is left open. In the Northern Hemisphere, the smaller vortex and the more restricted region of cold temperatures suggest that this region has a smaller theoretical maximum for column ozone depletion, about 40 percent of the currently observed change in the antarctic ozone column in spring. (Auth.)

I-43123

Trenberth, K.E., Large, W.G., Olson, J.G., **Mean annual cycle in global ocean wind stress**, *Journal of physical oceanography*, Nov. 1990 20(11), p.1742-1760, 40 refs.

The mean annual cycle in surface wind stress over the global oceans from surface wind analyses from the European Centre for Medium Range Weather Forecasts (ECMWF) for seven years (1980-86) is presented. The drag coefficient is a function of wind speed and atmospheric stability, and the density is computed for each observation. Annual and seasonal mean climatologies of wind stress, wind stress curl and Sverdrup transport and the first two annual harmonics of the wind stress are presented. The Northern and Southern Hemi-

spheres are contrasted, as are the Pacific and Atlantic basins. The representativeness of the climatology is also assessed. The main shortcomings with the current results are in the tropics. (Auth. mod.)

I-43142

Jones, P.D., **Antarctic temperatures over the present century—a study of the early expedition record**, *Journal of climate*, Nov. 1990 3(11), p.1193-1203, 50 refs.

Air temperature records for 26 expeditions to Antarctica that have overwintered, for periods of at least 9 months, between 1898 and 1958 have been assembled. Using a map of 1957-75 average annual temperature over Antarctica, the results for the expedition sites were made compatible with modern data. The expedition records are unfortunately confined mainly to two regions, the Antarctic Peninsula and the Ross Sea sectors. It is difficult, therefore, to generalize the results to the entire continental area. The expeditions are also somewhat irregularly spaced in time with relatively few occurring in the 1917-34 period. The best guess that can be made is that antarctic air temperatures now appear to be warmer, by at least 1 C, than those prevailing during the first decade of the twentieth century. The result is broadly consistent with temperature changes that have been reported for both land and marine regions over the rest of the Southern Hemisphere. This result is, however, in contrast with the course of temperature change over the Arctic region, where temperatures are now only 0.35 C warmer than in 1901. (Auth.)

I-43144

Zhou, X.J., Bian, L.G., Jia, P.Q., Lu, L.H., **Preliminary study on the surface thermal regime over the Great Wall Station in Antarctica**, *Chinese science bulletin*, Oct. 1990 35(19), p.1638-1642, 6 refs.

Concerning the thermal regime near the surface of Antarctica, micrometeorological observations and experiments have been carried out by both American and Japanese scientists in East Antarctica. However, West Antarctica has been rarely touched. In Dec. 1987-Feb. 1988 boundary layer observations were carried out over the Great Wall Station, 62.2S, 59W. The observing field was flat and covered with snow at the early stage (before Jan. 6). A microcomputer sampling system was used to measure various components of surface radiation balance and the 5 level gradient elements: 0.5, 2.0, 10.0, 20.0 and 32.0 m. This article analyzes the surface thermal regime in summer by using the boundary layer data obtained in the experiment. (Auth.)

I-43168

Rowland, F.S., **Stratospheric ozone depletion by chlorofluorocarbons**, *Ambio*, Oct. 1990 19(6-7), p.281-292, 56 refs.

Man-made chlorofluorocarbons (CFCs) such as CCl₂F₂ and CCl₃F are inert in the lower atmosphere and can survive for a hundred years or more without reaction. The only important destruction process for CFCs is ultraviolet photolysis in the stratosphere, with the release of atomic chlorine. Chlorine atoms attack stratospheric ozone with the formation of the free radical ClO which reacts further to regenerate atomic chlorine. This chain reaction can cause the removal of 100,000 molecules of ozone per Cl atom, and coupled with the emission to the atmosphere of one million tons of CFCs per year, produces ozone depletion on a significant global scale. Under the special meteorological conditions of the antarctic winter stratosphere, chlorine and nitrogen chemistry occur which permit massive ozone depletion in the lower stratosphere when sunlight returns in the spring. Similar chemistry has also been found in experiments carried out in the arctic stratosphere. Analysis of long-term records from ground stations has confirmed the loss of 2-3% ozone since 1970 in the Northern Hemisphere between 30N and 63N, with the heaviest losses in the winter. (Auth. mod.)

I-43199

Lubin, D., Frederick, J.E., **Ultraviolet monitoring program at Palmer Station, spring 1988**, *Antarctic journal of the United States*, 1989 24(5), p.172-174, 5 refs.

Measurements and preliminary analysis are presented of the springtime ultraviolet surface irradiance at Palmer Station. Although concerns over depletion of atmospheric ozone date back nearly two decades, these Palmer data are the first to show an increase in biologically relevant ultraviolet irradiance whose likely origin is human influence on the ozone layer. All data apply to local noon and encompass the period Sep. 19 through Dec. 21, 1988. The large day-to-day changes in the 340-nanometer irradiance arise from variations in cloudiness. Underlying these fluctuations is a gradual increase in irradiance over the observing period related to the decreasing noontime solar zenith angle. Rapid variations in the 300-nanometer irradiance arise from both changes in cloudiness and the ozone abundance. The presence of the ozone hole is apparent during middle to late Oct. The irradiance at 300 nanometers measured on day 293 (Oct. 19), more than 2 months before the summer solstice, is slightly greater than that on day 349 (Dec. 14). Supplementing the spectroradiometer data is a written record of sky conditions over Palmer Station during the observation period.

I-43214

De Mora, S.J., Grout, A., Shooter, D., **Analysis of reduced sulfur gases in air and melt waters by gas chromatography at Bratina Island, 78S, New Zealand antarctic record**, 1990 10(3), p.12-21, 12 refs.

Reduced sulfur gases were analyzed by gas chromatography with a flame photometric detector at Bratina I., as part of the RISE program. Water column and sub-cyanobacterial mat aqueous samples were examined from various sites within the Bratina Island Pond Study Area. Pond waters above the mats generally contained only dimethylsulfide (DMS) and carbon disulfide (CS₂). The sulfur gas composition of sub-mat waters was more variable, but often dominated by hydrogen sulfide (H₂S). The only reduced sulfur gases detected in the atmosphere were DMS and CS₂, a manifestation of the importance of biological activity within the aqueous systems of the dirty ice. (Auth.)

I-43227

Deshler, T., Hofmann, D.J., Hereford, J.V., **Vertical profiles of ozone and aerosol within, at the edge of, and outside of the antarctic polar vortex in the spring of 1988**, *Antarctic journal of the United States*, 1989 24(5), p.213-215, 6 refs.

Ozone and temperature profiles were obtained within, at the edge of, and outside the polar vortex with 41 balloon flights at McMurdo Station from Aug. 24 to Nov. 14, 1988. Optical particle counters were included on 4 flights to measure sulfate layer particles (radii greater than 0.15 micron), 4 flights to measure condensation nuclei (radii greater than 0.01 micron), and 2 flights to measure larger particles. A comparison of the 18 km temperature and ozone mixing ratio for 1986, 1987, and 1988 is shown. Averaged over Sep., the ozone mixing ratio at 18 km decayed with a half-life of 37 days compared to 28 days in 1986 and 12 days in 1987. Another figure presents vertical ozone and temperature profiles in late Aug. and at a maximum depletion for the 3 years. Measurements of sulfate layer aerosol indicated no upward motion within the vortex during ozone depletion. It is concluded that observations are consistent with the idea that the heterogeneous chemistry is a controlling factor in ozone depletion.

I-43228

Chuan, R., Palais, J.M., **Do gold, chromium oxide, and carbon-containing particles provide tracers of Mount Erebus emissions**, *Antarctic journal of the United States*, 1989 24(5), p.215-217, 5 refs.

After a review of aerosol samples collected since 1986 at the summit of Mount Erebus in the snow near the volcano and in the atmosphere above it, three types of particles are identified which are believed to be characteristic of the Mount Erebus emissions: crystalline particles of elemental gold, chromium-oxide particles, and carbon-containing particles. It is suggested that this identification will contribute to the assessment of the geographic extent of the transport of Mount Erebus emissions over Antarctica.

I-43229

Palais, J.M., Mosher, B.W., **Elemental tracers of volcanic emissions in antarctic aerosol and snow samples**, *Antarctic journal of the United States*, 1989 24(5), p.217-218, 2 refs.

An attempt is described to establish whether a trace elemental signature characteristic of Mount Erebus can be identified to help determine whether the volcano is an important source of trace elements and other impurities of the antarctic atmosphere. Comparison of the elemental ratios in Erebus plume samples and snow samples collected near the volcano allows one to determine whether snow samples provide good surrogates for aerosol measurements. It is suggested that the addition of approximately 0.25 g of starch contained in 10-15 ml of deionized water results in complete trace-metal recovery, while blank levels for most trace metals remain low when compared with levels reported in antarctic snow.

I-43230

Bromwich, D.H., **Satellite observations of katabatic winds blowing from Marie Byrd Land onto the Ross Ice Shelf**, *Antarctic journal of the United States*, 1989 24(5), p.218-221, 9 refs.

This pilot study suggests that marked drainage airflow may be resolved on winter thermal infrared satellite images of the Siple Coast area around 25% of the time. Usually, katabatic wind signatures are aligned parallel to the surface-wind directions recorded at adjacent automatic weather stations. The wind speeds associated with the signatures evaluated here are less than those studied earlier. About 10% of the time, katabatic airflows cross the Siple Coast propagate northward along the Transantarctic Mountains and appear to reach the northwestern edge of the Ross Ice Shelf. In the case presented here, this apparent 1,000 km propagation across flat terrain was associated with a cloud-free, quasi-stationary cyclone over the central Ross Ice Shelf, and may primarily consist of combined katabatic airstreams from Marie Byrd Land and Byrd Glacier.

I-43231

Parish, T.R., Bromwich, D.H., **Observational and modeling studies of the katabatic winds at Terra Nova Bay**, *Antarctic journal of the United States*, 1989 24(5), p.221-223, 11 refs.

Currently underway is a comprehensive study of the katabatic wind regime near Terra Nova Bay. This site was selected because previous studies have shown the area to be prone to intense katabatic winds for nearly the entire winter. Significant channeling of the cold air in the interior of the continent acts to make the Terra Nova Bay region one of the windiest in all of Antarctica. Automatic weather stations have been deployed at Inexpressible I., some 30 km downwind from the mouth of the Reeves Glacier, since 1984. More recently, an array of five additional automatic weather stations has been deployed to sample the spatial variation of the katabatic wind. In addition, four automatic weather stations have been set up in support of ongoing, cooperative meteorological studies of the Italian Antarctic Expedition. As part of the study, numerical simulations of the Terra Nova Bay katabatic wind regime have been conducted. The model used is a six-level, bulk-layer version of an earlier three-dimensional, hydrostatic, primitive equation model. A case study focuses on Terra Nova Bay to provide a comparison between the model simulations and the records from the AWS.

I-43232

Bromwich, D.H., Parish, T.R., **Strong katabatic wind event at Terra Nova Bay, *Antarctic journal of the United States*, 1989 24(5), p.223-225, 6 refs.**

The selected event started around the middle of Mar. 14 and ended on Mar. 22, 1988. The 9-day average wind speed at Inexpressible I. was 16.9 m/s and the strongest speed was 36 m/s; these 3-m-height values are close to the typical Mar. conditions reported in 1989 of 18.2 and 34 m/s, respectively. The wind-speed record displays major maxima and minima at intervals of about 1.5 days. The wind speeds measured by AWS 09 at the head of Reeves Glacier follow the general trend of the Inexpressible I. values. Notable differences do occur, as for example during the first half of Mar. 18 when the variations are anticorrelated. The results from this examination can be summarized as follows. The change from the strongest to the lightest winds at Inexpressible I. was associated with coherent variations of wind, temperature, and pressure throughout the area. Several of these changes can be rationalized in terms of the coupling between the interior confluence zone and the coastal katabatic winds.

I-43233

Wendler, G., **Katabatic winds in Adélie Land, East Antarctica, *Antarctic journal of the United States*, 1989 24(5), p.226-228, 8 refs.**

The focus of this report is on the relationship between wind speed and terrain slope angle between Dumont d'Urville and Dome C. The station at the highest altitude, Dome C, has the lightest average wind speed, while a station at less than half the altitude reported the highest speed. The strong influence of the gravitational force on wind speed also extended to annual variations at the slope stations, where winter speeds were about 30% higher than summer speeds. Other details coming from this analysis include the powerful wind directional constancy for all of the winter and the nights in summer; and a temperature gradient in the area of about 2.5 deg C/100 km.

I-43234

Machta, L., Ostlund, G., Hanson, K., **Tropospheric radiocarbon at Amundsen-Scott South Pole Station, Antarctica from 1972 to 1987, *Antarctic journal of the United States*, 1989 24(5), p.228-229, 4 refs.**

C-14 measurements for 1972 through 1987 analyzed in Miami are reported here. From 1972 to 1987, 6-day whole-air samples were collected in stainless steel, 900-cubic-inch spheres pressurized to 3,000 psi to obtain carbon dioxide aliquots. Extraction of the carbon dioxide was made prior to the shipment to Miami. Corrections for the measured C-13 isotopic composition of the sample were made, and the units of the reported values are the per mill ($\delta C-14$) deviation from the NBS standard. The South Pole Station C-14 measurements in per mill appear in a figure along with measurements for the period 1963-1980 from northern Norway. A few of the new South Pole Station values which are obviously erroneous have been omitted. The remaining 1972-1987 values depict a smooth decreasing trend despite the 2 1/2 year break. Norway values are higher than those at South Pole Station. It is likely that most of the bomb test C-14 in both high northern and equatorial latitudes as well as the cosmogenic C-14 was initially injected into the stratosphere. Hence the small difference between the north polar and south polar ground-level concentrations might be expected at steady state.

I-43235

Stone, R.S., Dutton, E.G., DeLuisi, J.J., **Surface radiation and temperature variations associated with cloudiness at the South Pole, *Antarctic journal of the United States*, 1989 24(5), p.230-232, 7 refs.**

Surface-radiation measurements were used to assess the potential for determining cloud-radiative influences on the surface temperature

field at the South Pole. Because the south polar surface is horizontally homogeneous and its radiation regime is thought to characterize a large region of the Antarctic Plateau, it is an ideal high-latitude site to investigate "regional" cloud effects. The measurements used in this study were made at the South Pole Observatory. Acquired data consist of upward and downward fluxes of shortwave and longwave irradiances, direct-beam solar irradiance, and surface meteorological variables. Only daily mean values of "surface" temperature measured at 2 m, the downward longwave irradiance, and the direct-beam irradiance are analyzed and correlated with daily mean total sky-cover data. It should be noted that nighttime sky-cover observations made at the South Pole are subject to errors related to lunar brightness. Thick clouds can be distinguished from less dense clouds even during the darkest periods, but thin or scattered sky cover is systematically underestimated when the moon is relatively bright. No correction for such a bias was applied to the sky-cover data used in this analysis.

I-43236

Bodhaine, B.A., **South Pole aerosol measurements, *Antarctic journal of the United States*, 1989 24(5), p.233-235, 12 refs.**

The Geophysical Monitoring for Climatic Change (GMCC) program conducts measurements of climatically important gases and aerosols at Amundsen-Scott Station. Condensation nuclei concentration has been measured since 1974, and aerosol scattering extinction (σ_{sp}) has been measured (using a four-wavelength nephelometer) since 1979. The first year of σ_{sp} data showed an annual cycle strikingly different from the condensation nuclei record, being dominated by sea-salt events in the austral winter. An aerosol chemistry experiment was conducted during 1982 and the results were presented in 1986 and 1987. In 1987, a more extensive aerosol experiment was conducted that included aerosol filter samples for PIXE analysis, aerosol size-distribution measurements in the Aitken size range, and aerosol black-carbon measurements. Condensation nuclei concentration is measured continuously with a General Electric automatic condensation nuclei counter. Calibration points for the automatic condensation nuclei counter are obtained twice daily with a Pollak condensation nuclei counter.

I-43237

Conway, T.J., Thoning, K.W., **Short-term variations of atmospheric carbon dioxide at the South Pole, *Antarctic journal of the United States*, 1989 24(5), p.236-238, 6 refs.**

The time series of atmospheric carbon dioxide measurements at the South Pole, begun in 1957 by collecting samples in glass flasks, constitutes one of the longest and most dramatic records of human impact on the environment. Since 1975, the Geophysical Monitoring for Climatic Change Division (GMCC) has been measuring atmospheric carbon dioxide concentration at the South Pole using an *in situ* nondispersive infrared analysis apparatus. The results of this program through 1988 are presented as monthly mean concentrations in graph form. The major features of this record are the increase due primarily to fossil fuel combustion and the annual variation due to a combination of seasonal biospheric fluxes, sea-air exchange, and atmospheric transport. Because the South Pole is so remote from major sources and sinks of carbon dioxide, the measured carbon dioxide concentrations generally show very little variation over time periods ranging from hours to days. An analysis of the data from 1975 through 1982 concluded that carbon dioxide variations occurring over periods shorter than 5 days were not significant. Recent improvements in the measurement precision have prompted an analysis of the short-term variations in the carbon dioxide concentrations measured during 1986.

I-43238

Khalil, M.A.K., Rasmussen, R.A., **Seasonal cycles of hydrogen and carbon monoxide in polar regions: opposite-phase relationships**, *Antarctic journal of the United States*, 1989 24(5), p.238-239, 5 refs.

The seasonal cycles of trace gases are driven directly or indirectly by seasonal variations of temperature and solar radiation. Normally in each hemisphere, the cycles of production and destruction lead to significantly lower concentrations of biogenic gases during summer and early fall months compared to other times of the year. The seasonal variations of methane, carbon monoxide, and hydrocarbons are well-known examples of such behavior. Hydrogen (H_2) does not follow this pattern even though many of its sources are the same as for carbon monoxide. Measurements of H_2 and carbon monoxide taken between May 1985 and May 1987 at the South Pole and at Barrow, AK, are shown in a graph on which there are two noteworthy features. First, the seasonal variation of carbon monoxide is out of phase in the two hemispheres, as expected, but the seasonal variation of H_2 is in phase. When concentrations of H_2 are high in the Arctic, they are also high in the Antarctic—a most unusual pattern. Second, the concentration of carbon monoxide is more than twice as high in the Arctic as in the Antarctic, but this “interhemispheric gradient” is reversed for H_2 : there is more H_2 in the Antarctic than in the Arctic.

I-43239

Steele, L.P., Lang, P.M., Martin, R.C., **Atmospheric methane in Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.239-241, 8 refs.

Because of its isolation, the antarctic environment is ideal for making background measurements of atmospheric methane. Various aspects of methane over Antarctica are reviewed: the significance of measuring amounts of atmospheric methane, methane effect on the ozone hole, how measurements are made and analyzed, and calculations of methane growth rate.

I-43240

Stearns, C.R., Weidner, G.A., **Antarctic automatic weather stations: austral summer 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.242-243, 2 refs.

The United States Antarctic Program (USAP) automatic weather station project places automatic weather station units in remote areas of Antarctica in support of meteorological research. The USAP automatic weather station units support the following studies: barrier wind flow along the Antarctic Peninsula and the Transantarctic Mountains; katabatic wind flow down the slope to the Adélie Coast, Reeves Glacier, Byrd Glacier, and Beardmore Glacier; mesoscale circulation and the sensible and latent heat fluxes on the Ross Ice Shelf; and climatology of Byrd, Siple, and Dome C stations. A table gives the automatic weather station unit location, identification number, latitude, longitude, elevation, and the start date for the 27 automatic weather station units in operation during 1989. Three units have been abandoned since 1980. A brief account of the field season mainly involves visiting AWS sites, checking the operation of the systems, and making any needed repairs.

I-43245

Downey, A., Jasper, J.D., Gras, J.L., Whittlestone, S., **Lower tropospheric transport over the southern ocean**, *Journal of atmospheric chemistry*, July/Aug. 1990 11(1-2), p.43-68, 20 refs.

Radon and particle concentrations obtained at Macquarie I., half-way between Australia and Antarctica, and on Tasmania's northwest coast at Cape Grim during 1987 are examined. Four-day trajectories based on 12 hourly analyses over the Australian region are used to explore the transport of continental material across the southern ocean. This study suggests that at least 25% of the variance of radon

concentration at Macquarie I. can be accounted for by transport from the Australian continent. Trajectories at intervals of one hour are used to demonstrate the agreement between episodes of trajectories passing over land and episodes of elevated radon and particle concentration. Wind roses of percentage probability of various levels of radon and particle concentration are compared with back trajectories for their accuracy in depicting episodes of continental air incursion. (Auth.)

I-43246

Nguyen, B.C., Mihalopoulos, N., Belviso, S., **Seasonal variation of atmospheric dimethylsulfide at Amsterdam Island in the southern Indian Ocean**, *Journal of atmospheric chemistry*, July/Aug. 1990 11(1-2), p.123-141, Refs. p.139-141.

Daily measurements of atmospheric concentrations of dimethylsulfide (DMS) were carried out for two years in a marine site at a remote area: Amsterdam I. located in the southern Indian Ocean. DMS concentrations were also measured in seawater. A seasonal variation is observed for both DMS in the atmosphere and in the sea-surface. The monthly averages of DMS concentrations in the surface coastal seawater and in the atmosphere ranged, respectively, from 0.3 to 2.0 nmol/l and from 1.4 to 11.3 nmol/cu m (34 to 274 pptv), with the highest values in summer. The monthly variation of sea-to-air flux of DMS from the southern Indian Ocean ranges from 0.7 to 4.4 micro-mol/sq m/d. A factor of 2.3 is observed between summer and winter, with mean DMS fluxes of 3.0 and 1.3 micro-mol/sq m/d, respectively. (Auth.)

I-43247

Bonsang, B., Kanakidou, M., Lambert, G., **NMHC in the marine atmosphere: preliminary results of monitoring at Amsterdam Island**, *Journal of atmospheric chemistry*, July/Aug. 1990 11(1-2), p.169-178, 19 refs.

Between Jan. 1984 and May 1987, C2 to C5 NMHC concentrations, and radon-222 activities were measured at Amsterdam I. in the Indian Ocean. A large variability of about one order of magnitude was observed in the NMHC concentrations. Most of the samples were collected under marine influence. Using ethene as a reference compound for marine emissions, it appears that the NMHC/ethene composition of the air and its variability directly reflect the composition of dissolved gases in surface seawater. Only the ethane/ethene ratio presents a significant deviation from this typical composition and this can be attributed to a continental component. At sea level, the reaction frequency of OH radicals with the NMHC is similar to that of methane and carbon monoxide. Thus, the contribution of marine NMHC should be taken into account in the modelling of oxidants in remote atmospheres. (Auth.)

I-43248

Dick, A.L., **Simple model for air/snow fractionation of aerosol components over the Antarctic Peninsula**, *Journal of atmospheric chemistry*, July/Aug. 1990 11(1-2), p.179-196, 21 refs.

A model has been set up to investigate the wet and dry aerosol removal processes which occur in clean air over the Antarctic Peninsula. Input for the model was obtained from bulk chemical analysis and scanning electron microscopy of aerosol and snow samples collected simultaneously at remote sites around the Peninsula. The model predicts that sulphate and sea-salt aerosol will be removed mainly in-cloud by riming of falling snow and ice crystals. Crustal aerosol is principally removed by acting as nuclei for these crystals and by impaction on falling snow. For the largest locally-generated aerosol, dry deposition is indicated as the major removal process. These findings suggest a possible mechanism for the observed air/snow fractionation. (Auth.)

I-43249

Heintzenberg, J., Bigg, E.K., **Tropospheric transport of trace substances in the Southern Hemisphere**, *Tellus*, Sep. 1990 42B(4), p.355-363, 28 refs.

The mean annual cycle of elemental carbon (EC) has been deduced from a 7-year series of measurements made at Cape Grim, Tasmania. The most conspicuous features are a spring (Oct.) maximum and summer (Jan.) minimum. These are also found in the mean annual cycle at Cape Grim of carbon monoxide thought to be produced at the same time and in the same regions. Comparison of the tracer cycles at Cape Grim, Cape Point, S. Africa and over Antarctica suggests that the spring maximum could be due to a peak in production of combustion products from biomass burning at low latitudes which is propagating throughout the Southern Hemisphere. If so, it is perhaps fortunate for the cleanliness of the Antarctic that the production does not occur at the time of maximum poleward transport but instead at its minimum. (Auth. mod.)

I-43278

Rowland, F.S., **Chlorofluorocarbons (CFCs) in the atmosphere: stratospheric ozone depletion and the greenhouse effect**, Symposium on Global Change Studies, 2nd, New Orleans, LA, Jan. 14-18, 1991, Boston, MA, American Meteorological Society, 1991, p.87-92, 8 refs.

Three expeditions to the southern polar region were carried out during 1986 and 1987, two on the ground in Antarctica and the third using aircraft based in Punta Arenas, Chile. These expeditions have successfully elucidated the chemical and physical processes involved in the formation of the antarctic ozone hole each Sep. Concentrations of ClO as high as 1.3 ppbv have been measured over Antarctica and also over the Arctic during the winter of 1988-89—more chlorine as ClO than was present in all chemical forms in 1970. Detailed study of the experimental data conclusively shows that the ClO_x chains are the cause of the ozone depletion over Antarctica and that most of the chlorine in the ClO_x chains was put into the atmosphere by mankind. (Auth. mod.)

I-43279

Hogan, A.W., Egan, W.G., Samson, J.A., Barnard, S.C., Riley, D.M., Murphey, B.B., **Seasonal variation of some constituents of antarctic tropospheric air**, *Geophysical research letters*, MP 2806, Dec. 1990 17(12), p.2365-2368, 22 refs.

The interior of Antarctica is dominated by the continental Antarctic [cA] air mass, which resides entirely on the antarctic ice, and only receives heat, moisture and particles by exchange with surrounding air masses. The concentrations of carbon dioxide, total aerosol, and soot aerosol do not vary coincidentally in this air mass during antarctic spring. A hypothesis describing the modification of these properties within the cA air mass through exchange with the surrounding air masses and variation of the source strength of marine aerosol in maritime polar air masses is proposed. (Auth.)

I-43280

Smith, V.R., Steenkamp, M., **Climatic change and its ecological implications at a subantarctic island**, *Oecologia*, 1990 85(1), p.14-24, Refs. p.23-24.

Marion I. has one of the most oceanic climates on earth, with consistently low air temperatures, high precipitation, constantly high humidity, and low incident radiation. Since 1968 mean surface air temperature has increased significantly, by 0.025 C/year. This was strongly associated with corresponding changes in sea surface temperature but only weakly, or not at all, with variations in radiation and precipitation. It is suggested that changing sea-level (atmospheric and oceanic) circulation patterns in the region underlie all of these changes; a scenario is presented of the implications of climatic change for the structure and functioning of the island's ecosystem. Primary

production on the island is high and consequently the vegetation has a large annual requirement for nutrients. An increasing mouse population, through enhanced predation pressure on soil invertebrates, will decrease overall rates of nutrient cycling and cause imbalances between primary production and decomposition. (Auth. mod.)

I-43308

Krass, M.S., Merzlikin, V.G., **Radiative thermophysics of snow and ice** [Radiatsionnaya teplofizika snega i l'da], Leningrad, Gidrometeoizdat, 1990, 260p., In Russian with English summary and table of contents. 143 refs.

The authors present a working theory of the radiative thermophysics of snow and ice. Optical and physical models for different types of snow and ice were studied. The models take into account snow and ice-atmosphere interaction by means of convective heat transfer, solar flux, and long-wavelength reradiation. A chapter is devoted to the thermophysics of antarctic lakes, especially Lake Vanda. (Auth. mod.)

I-43338

Reed, L., **U.S. Naval Support Force, Antarctica: weather operations, 1988-1989**, *Antarctic journal of the United States*, 1989 24(5), p.284-285.

Antarctica is the land of science, where research and exploration are the focus of U.S. natural policy. The mechanics by which this policy is carried out rely almost entirely upon an effective responsive, and safe logistic support program. Safety is the driving concern in all logistics operations. Aviation, ship, and cargo operations are potentially dangerous in any locale but particularly in an environment as harsh as Antarctica. The hazards associated with whiteout conditions, fog, hurricane-force winds, severe wind chill, and shifting ice floes make weather support synonymous with safety support. A brief review is given of the difficulties confronting the weather forecaster, with special emphasis on the paramount importance of communications in the forecasting process.

I-43354

Simmonds, I., **Improvements in General Circulation Model performance in simulating antarctic climate**, *Antarctic science*, Dec. 1990 2(4), p.287-300, Refs. p.299-300.

Increasingly, many aspects of the study of Antarctica and the high southern latitudes are being aided by various types of numerical models, among which are the General Circulation Models (GCMs). The changes in the ability of GCMs used over the last two decades to simulate aspects of atmospheric climate at high southern latitudes are traced, and it is concluded there has been a steady improvement in model products. It is suggested that the quality of the climates produced by most modern GCMs in many aspects cannot be said to be poor, especially considering the uncertainties in 'observed' climate. There is obviously a need for improvements in both modelling and observations. Finally, some topics are highlighted in which the formulation of models could be improved, with special reference to better treatment of physical processes at high southern latitudes. (Auth. mod.)

I-43384

Hossain, J., **Estimation of specific annual energy generation from wind in Antarctica**, *Solar and wind technology*, 1990 6(1), p.91-95, 6 refs.

It is established that wind is the major source of energy in Antarctica. A Weibull distribution is assumed in energy estimations. Errors in estimations with shape parameters 1.1 and 2.9 as compared with Rayleigh distributions are also computed.

I-43390

Rasch, P.J., Williamson, D.L., **Computational aspects of moisture transport in global models of the atmosphere**, *Royal Meteorological Society, London. Quarterly journal*, July 1990 116B(495), p.1071-1090, 15 refs.

A set of properties useful in characterizing numerical methods for modelling atmospheric transport are identified. Spectral and semi-Lagrangian methods, which are very different in terms of these desired properties, are compared. The extent to which the schemes do not satisfy certain properties of the continuous equations provides a measure of one component of the error of the solution. For the spectral scheme, negative specific humidities indicate such an error component. Conventional semi-Lagrangian schemes are also susceptible to generating negative values. In addition, they are not inherently conservative. Shape-preserving semi-Lagrangian methods do not generate negative values, but still are non-conservative. The degree to which the advection process does not conserve mass provides a measure of another error associated with the numerical solution. The negative error is shown to be large for the spectral transport scheme, measured either locally or globally. Measured globally, the semi-Lagrangian transport schemes' conservation errors are equally large. Locally, the correction of this error can be made very much smaller, relative to physical processes in the model. The study highlights the computational problems which still exist within the better numerical methods used to simulate the transport of water vapor, and demonstrates the care with which one must apply computational constraints to the solution. The spectral and semi-Lagrangian transport schemes produce very different climatologies in model simulations. Several of the figures illustrating various aspects of the model show a latitudinal range extending from 90N to 90S. (Auth. mod.)

I-43409

Saxena, V.K., Ruggiero, F.H., **Aerosol measurements at Palmer Station, Antarctica**, *American Geophysical Union. Antarctic research series*, 1990 Vol.50, Contributions to antarctic research 1, edited by C.R. Bentley, p.1-5, 16 refs.

The Antarctic Peninsula is located near the polar jet stream and is frequently in the track of storms moving from the surrounding oceans to the South Pole. Aerosols were sampled at Palmer Station, located on the Peninsula, during almost the entire year of 1983, using a submicroscopic particulate sampling assembly, and were analyzed using a scanning electron microscope in conjunction with an X ray energy dispersive spectrometer. A spectrum of 15 elements was obtained within 100 s for each filter sample. The crustal and marine components of aerosol particles were analyzed with respect to the winds recorded at the station. Results reveal that sea-salt aerosols from the ocean and crustal aerosols from exposed rocks are the principal components of the aerosol budget at Palmer Station. The sources of sulfur seem to be more homogeneously and widely distributed around Palmer Station as compared with the sources of chlorine and aluminum. (Auth. mod.)

I-43410

Saxena, V.K., Ruggiero, F.H., **Antarctic coastal stratus clouds: microstructure and acidity**, *American Geophysical Union. Antarctic research series*, 1990 Vol.50, Contributions to antarctic research 1, edited by C.R. Bentley, p.7-18, Refs. p.17-18.

A study of antarctic coastal stratus clouds over the Ross Ice Shelf was carried out in order to investigate their microstructure and the acidity of cloud water. A forward scattering spectrometer probe, a cloud condensation nucleus (CCN) spectrometer, and a cloud water collection probe were mounted aboard an instrumented LC-130 aircraft to measure the cloud droplet size distribution and the CCN activation spectrum, and to collect cloud water samples. Snow and seawater samples were also collected for the purpose of comparing

their ionic contents with those of the cloud water. The droplet size distribution showed a bimodality which is not explained by classical condensational growth theory. The liquid water content of the clouds varied by a factor of 3 in the range 0.06-0.18 g/cu m. An estimate of the cloud supersaturations was made by one-to-one correspondence between the activated CCN and the droplet number concentration. An excess of sulfate found in the cloud water is believed to be of biogenic origin from the ocean. (Auth. mod.)

I-43420

McGrath, M.P., Clemitshaw, K.C., Rowland, F.S., Hehre, W.J., **Structures, relative stabilities, and vibrational spectra of isomers of Cl₂O₂: the role of chlorine oxide dimer in antarctic ozone depleting mechanisms**, *Journal of physical chemistry*, July 26, 1990 94(15), p.6126-6132, 49 refs.

Quantitative ab initio molecular orbital calculations have been applied to the description of the structures, relative stabilities, and vibrational spectra of isomers of Cl₂O₂. The highest level of calculations performed suggests that C₂ symmetry ClOOC (chlorine peroxide) is the lowest energy form but that the hypervalent, C_s symmetry species ClClO₂ (chloryl chloride) is only about 1 kcal/mol higher in energy. A third form, C₁ symmetry ClOClO (chlorine chlorite), lies higher in energy by 7 kcal/mol. The theoretical results are compared with experimentally determined thermochemical and vibrational data, and the role of the chlorine oxide dimer in antarctic ozone depleting mechanisms is discussed. (Auth. mod.)

I-43486

Shanklin, J.D., Gardiner, B.G., **Antarctic ozone hole**, Cambridge, British Antarctic Survey, 1989, 9p.

Ozone measurement techniques and instruments are briefly described. Photographs and samples of ozone profiles, as well as a map of Antarctica showing sites where ozone research is carried out, are presented. Answers are provided to questions such as, when was the hole discovered; will it get bigger and is it dangerous to scientists in Antarctica; how long has the antarctic ozone layer been studied and what are the British and American scientists doing; what is the Montreal Protocol; where are CFCs found, and where can more information on the subject be found.

I-43487

Shanklin, J.D., **Antarctic stratospheric temperature and ozone trends**, *Proceedings of the Third International Conference on Southern Hemisphere Meteorology and Oceanography*, Buenos Aires, Nov. 13-17, 1989, Boston, American Meteorological Society, 1989, p.412-413, 3 refs.

Total ozone at Halley and Faraday Stations has been measured with a Dobson ozone spectrophotometer since the IGY, and measurements are continuing. At Halley, a new instrument, Dobson number 123, was installed in Jan. 1982. The old instrument (number 31) was returned to the UK, refurbished and replaced Dobson number 73 at Faraday in Dec. 1984. The ozone data from Halley led to the discovery in 1984 of what is now known as the antarctic ozone hole. This reduction of ozone during the antarctic spring has altered the radiative balance of the stratosphere, with consequent changes to its temperature profile. Temperatures for the 100 hPa level (about 15 km, which is just below the peak in ozone concentration), are given in a table.

I-43515

James, I.N., **Influence of Antarctica on the flow in the Southern Hemisphere troposphere**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. *Proceedings. University research in Antarctica*, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.23-34, 15 refs.

The work carried out at Reading under the first BAS Antarctic Special Topic program has demonstrated the dominance of Antarctica in forcing planetary scale disturbances in the circulation of the Southern Hemisphere troposphere as far north as 40S, and possibly beyond. The drainage flow, which has hitherto received attention mainly as a local phenomenon, is seen to have hemispheric implications. The steering of eddies by the planetary wave pattern results in a transient-mean flow interaction which tends to amplify that pattern. More work needs to be done on the multilevel calculations, which have a number of shortcomings, particularly in their simulation of the mid-latitude baroclinic region. (Auth.)

I-43516

Mobbs, S.D., Rees, J.M., Darby, M.S., Brindley, J., King, J.C., **Internal gravity waves in the atmospheric boundary layer**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.35-41, 13 refs.

An intensive series of experiments to observe the atmospheric boundary layer was carried out at Halley Station during 1986. The project was concerned with turbulence and internal gravity waves during conditions of stable stratification. This paper reviews the internal gravity wave part of the experiment. The observations consisted of wind and temperature measurements on a 32 m mast, supplemented by measurements from two 8 m masts, radiosondes and a monostatic Sodar. A range of data analysis and numerical modelling approaches are described, leading to the conclusion that there are two principal causes of the internal gravity waves. Some waves are generated by dynamical instability at levels well above the boundary layer, whereas others are trapped near the surface and appear to be of topographic origin. Analysis of radiosonde data suggests that the waves have a significant effect on the mean flow. (Auth.)

I-43530

Rigaud, P., Leroy, B., **Presumptive evidence for a low value of the total ozone content above Antarctica in September, 1958**, *Annales geophysicae*, Nov. 1990 8(11), p.791-794, 14 refs.

Ozone spectrographic measurements, using stars, moon or blue sky as light sources, were performed in 1958 at Dumont d'Urville. Re-examination of the data shows that a strong minimum of the total ozone content was observed that year in the Austral springtime. This suggests a natural phenomenon to explain the antarctic ozone hole.

I-43531

De Muer, D., **Comment on "presumptive evidence for a low value of the total ozone content above Antarctica in September, 1958," by P. Rigaud and B. Leroy**, *Annales geophysicae*, Nov. 1990 8(11), p.795-796, 5 refs.

The author suggests that the ozone measurements at Dumont d'Urville examined by Rigaud and Leroy were of insufficient record length to achieve unbiased data; that no account was taken of the meteorological elements involved; that the vortex has deepened since 1958; that the seasonal timing of the ozone hole has shifted from Sep. (1958) to Oct. (1980); that the hole seldom extends to the latitude of Dumont d'Urville; and that a much closer examination of the 1958 data is needed to verify its veracity.

I-43550

Makarov, N.A., Svetogorova, L.V., **Spectral analysis of wind velocity in the antarctic meteor region during the summer and winter seasons of 1985 and 1986**

[Spektral'nyi analiz skorosti vetra v meteornoj zone Antarktidy dlia letnego i zimnego sezona 1985, 1986 gg.], *Institut eksperimental'noj meteorologii. Trudy*, 1990 21(143), p.63-67, In Russian. 4 refs.

Presented are summer and winter spectra of zonal and meridional wind velocity at an altitude of 95 km from data obtained at Molodezhnaya Station during the 1985-1986 seasons. Month to month spectral changes are traced; seasonal progress of isolated fluctuations is discussed.

I-43551

Makarov, N.A., **Wind regime in the south polar lower thermosphere in 1986 from radiometeoric measurements** [Rezhim vetra iuzhno-poliarnoj nizhenj termosfery v 1986 g. po dannym radiometeornykh izmerenij], *Institut eksperimental'noj meteorologii. Trudy*, 1990 21(143), p.67-72, In Russian. 7 refs.

Measurements of the wind regime at altitudes of 90-100 km at Molodezhnaya Station, by radar sounding of meteor trails in 1986, are presented and analyzed. In the seasonal progress of prevailing winds, a yearly periodicity is observed which is linked to the summer and winter regime of the lower-thermosphere circulation. Remarkable changes of the wind regime characteristics occur in winter, with abrupt weakening of the westerly winds. A strengthening of meridional transport of air masses occurs in lower thermosphere circulation, shortly before the transition from winter to summer regimes.

I-43558

Nunez, M., Nilsson, C., Marchant, H., **UV climate over the southern ocean south of Australia and its biological impact**, 1990-91 Australian Antarctic Research Program. Antarctic Treaty exchange information: Supplement A to particulars for ANARE, Kingston, Tasmania, 1990, p.159-162, 12 refs.

A project is outlined to determine the ultraviolet (UV) radiation climate over the southern ocean south of Australia, and to investigate aspects of the response by selected species of phytoplankton, especially *Phaeocystis*, to exposure to UV radiation.

I-43569

Angell, J.K., **Influence of equatorial QBO and SST on polar total ozone, and the 1990 antarctic ozone hole**, *Geophysical research letters*, Sep. 1990 17(10), p.1569-1572, 10 refs.

Based on data through 1989, comparisons are made between the variation of total ozone at Resolute, Canada and South Pole, and the variation of low-stratospheric temperature at Singapore (reflecting the equatorial QBO) and SST in eastern equatorial Pacific (reflecting the ENSO phenomenon). Total-ozone variations at Resolute have been more closely related to the QBO, whereas the total-ozone variations at South Pole appear to have been almost equally related to QBO and SST. In the 6 cases when June-July-Aug. (JJA) values of both Singapore temperature and equatorial SST increased from one year to the next, the spring values of South Pole total ozone have decreased, whereas in the 6 cases when both temperature and SST decreased from one year to the next, South Pole total ozone has increased. Both Singapore temperature and equatorial SST will probably be warmer in JJA of 1990 than they were in JJA of 1989 suggesting, based on these previous relations, an even deeper antarctic ozone hole in 1990 than in 1989 and ending the biennial variation in depth of the hole of the last 6 years. (Auth. mod.)

I-43579

Manson, A.H., **Tidal winds from the mesosphere, lower thermosphere global radar network during the second LTCS campaign: December 1988**, *Journal of geophysical research*, Feb. 1, 1991 96(A2), p.1117-1127, 17 refs.

Winds and tides were measured by 9 MLT (mesosphere, lower thermosphere) radars with locations between 70N and 78S, including an equatorial station at Christmas I. The mean winds were eastward (westward) in the northern (southern) hemisphere mesosphere, consistent with midwinter circulations. For the 12-hour (semidiurnal) tide, observations and the model of Forbes and Vial (1989) were in generally good agreement: in both cases northward components were closer to being in phase in the two hemispheres, and winter wavelengths were shorter than those of the mid-latitude summer. For the 24-hour (diurnal tide), the radar observations and model of Forbes and Hagan (1988) were in useful agreement in the summer hemisphere. However, the short (long) wavelengths at mid (high) latitudes of the model's winter hemisphere were not observed during LTCS (Lower Thermosphere Coupling Study) 2, nor in climatologies for Dec. Suggestions as to the reasons for this disparity are presented. (Auth. mod.)

I-43610

Trodahl, H.J., Buckley, R.G., **Enhanced ultraviolet transmission of antarctic sea ice during the austral spring**, *Geophysical research letters*, Nov. 1990 17(12), p.2177-2179, 12 refs.

In determining the effect of the recent enhanced UV levels on antarctic life it is important to know UV radiance under the vast sea ice cover surrounding the continent. This radiance is influenced by the transmission of the ice, and in this paper the first UV measurements on this turbid medium are reported. The transmission is largest in the Spring, so that life under the ice has always experienced its major UV irradiation dose in Oct. Dose enhancements by as much as an order of magnitude will have been experienced under the ozone holes of recent years. (Auth.)

I-43611

Stamnes, K., Slusser, J., Bowen, M., **Biologically effective ultraviolet radiation, total ozone abundance, and cloud optical depth at McMurdo Station, Antarctica, September 15, 1988 through April 15, 1989**, *Geophysical research letters*, Nov. 1990 17(12), p.2181-2184, 21 refs.

Spectral measurements of solar ultraviolet (UV) radiation taken at McMurdo Station are used to determine biologically effective UV dose, ozone column content, and effective cloud optical depth. The seasonal variation in these parameters from Sep. 15, 1988 through Apr. 15, 1989 is presented and discussed. Although no days from Sep. 15 through Oct. experienced UV dose exceeding that occurring at summer solstice, the temporal variation in the level of UV radiation is markedly asymmetric with respect to summer solstice. A general enhancement by about 20% in biologically effective UV dose in Oct, 1988 compared to Mar., 1989 is clearly evident. The main cause of this asymmetry appears to be the coincident deficiency in ozone abundance by about 8% in spring compared to fall. (Auth.)

I-43612

Rosen, R.D., Salstein, D.A., **On the quality of eddy heat flux calculations in the vicinity of the antarctic lower stratosphere**, *Geophysical research letters*, Oct. 1990 17(11), p.1901-1904, 8 refs.

The ability of analyses from the National Meteorological Center and the European Centre for Medium Range Weather Forecasts to depict the dynamics of the high latitude Southern Hemisphere lower stratosphere is examined by considering time series of daily values of

a meridional eddy heat flux term at 100 mb during 1986. Both analyses yield series of this quantity that although highly variable are nevertheless well correlated with each other. Coupled with the credible spatial structure of the heat flux field in the analyses, this agreement offers support for the realism of the eddy heat flux calculations. Despite the possible presence of low-frequency problems in the analyses, the authors conclude that they are adequate for studying important atmospheric phenomena that occur in this region of the Southern Hemisphere at sub-monthly time scales. (Auth.)

I-43622

Gil, M., Cacho, J., **Instrumentation for total NO₂ ground-based measurements in the stratosphere. Observations over Antarctica** [Instrumentación para la medida desde tierra del contenido total de NO₂ en la estratosfera. Observaciones en la Antártida], *Anales de química*, 1990 86(6), p.603-607, In Spanish with English summary. 24 refs.

By making use of the technique first described by Brewer and Noxon, an instrument was designed and manufactured for ground based NO₂ total content measurements in the stratosphere by long path differential absorption spectrometry in the visible. The scattered light coming from the zenith is used as a source. In this paper, a description of the instrument, measurement procedure and data reduction are presented together with the results obtained in Antarctica during the 1988 spring season. The measured total content is very low when compared with that at middle latitudes, suggesting the existence of a stable kind acting as a reservoir or, alternatively, a denitrification mechanism in the region for that time of year. (Auth.)

I-43623

Gil, M., Acedo, L., **Stratospheric nitric and photodissociation constants during antarctic spring** [Constantes de fotodisociación del ácido nítrico estratosférico en la primavera antártica], *Anales de química*, 1990 86(6), p.608-612, In Spanish with English summary. 24 refs.

The observed denitrification of the core of the polar vortex during the antarctic spring is the result—according to the most accepted theory—of active nitrogen oxide conversion to stable nitric acid. However, observations carried out at 64S do not reflect the expected NO₂ increase resulting from nitric acid photodissociation. Results of the calculation of photodissociation constants for the mentioned constituent are shown by using an unidimensional radiative model. An explanation for the low levels of the observed NO₂ is suggested. (Auth.)

I-43644

Schneider, H.R., Ko, M.K.W., Peterson, C.A., Nash, E., **Interannual variations of ozone: interpretation of 4 years of satellite observations of total ozone**, *Journal of geophysical research*, Feb. 20, 1991 96(D2), p.2889-2896, 23 refs.

Observations between latitudes 90N and 90S show that the monthly zonal mean total ozone between 1978 and 1982 varies by as much as 5% with respect to the 4-year average. These variations have been analyzed with the aid of a two-dimensional chemistry transport model. Observed temperatures and meridional stream functions, calculated from data, were used as inputs for the model. Deviations of the model-calculated total ozone from the 4-year mean were compared with the observed variations. It is shown that a substantial part of the observed variability of total ozone is reproduced by the model, despite uncertainties in the heating rates and without any special attempts to obtain consistent eddy diffusion or otherwise to tune the model. Results indicate that the temperature dependence of the ozone gas phase chemistry plays a negligible role in explaining the observed interannual variations in total ozone. A large part of the

variability can be explained by the year-to-year differences in the transport circulation. The variability of the diabatic circulation is shown to be largely independent of the ozone fluctuations and to be a consequence of the observed temperature variations. (Auth. mod.)

I-43645

Hofmann, D.J., Deshler, T., **Stratospheric cloud observations during formation of the antarctic ozone hole in 1989**, *Journal of geophysical research*, Feb. 20, 1991 96(D2), p.2897-2912, Refs. p.2910-2912.

The results of six balloon flights at McMurdo Station under varying temperature conditions are used in a study of polar stratospheric clouds during Sep. 1989. A new particle counter indicated that size distributions observed in the clouds were bimodal. Mode radii ranging from 0.05 to 0.10 micron were observed for the small particle mode, representing the sulfate layer or condensational growth enhancements of it. Mode radii generally ranged from 1.5 to 3.5 micron for the large particle mode at concentrations 3 to 4 orders of magnitude lower than the small particle mode. The large particle mode, when observed at temperatures above the water ice point, is believed to be the result of nitric acid trihydrate (NAT) condensation on larger particles of the sulfate layer. In this case the HNO₃ condensed mass mixing ratios were 1 to 5 ppbv for most of the cloud layers. Generally, the large particle NAT concentrations were higher in the lower stratosphere, indicating the redistribution of HNO₃ through particle sedimentation. Distributions were observed with mode radii as high as 7 micron, and correspondingly large inferred mass, indicating water ice clouds in the 12 to 15 km region. Absence of such clouds at very low temperatures implied water vapor mixing ratios of less than 3 ppmv. (Auth.)

I-43646

Callis, L.B., **Ozone depletion in the high latitude lower stratosphere: 1979-1990**, *Journal of geophysical research*, Feb. 20, 1991 96(D2), p.2921-2937, Refs. p.2936-2937.

Archived Stratospheric Aerosol and Gas Experiment (SAGE, SAGE II) and Solar and Backscattered Ultraviolet (SBUV) data are used to examine lower stratospheric O₃ variations at 50 deg latitude in both hemispheres. These data indicate that from 1979 to 1985, 73-90% of the total O₃ changes have occurred below approximately 25 km in altitude. Significant O₃ depletions (up to 15%) have occurred in the partial column (127-15.8 mbar) in both hemispheres, with indications of a recovery after 1985. Both the SAGE/SAGE II and SBUV observations show essentially the same changes for this partial column. Below 20 km and between 1979 and 1985, larger local O₃ depletions are suggested by the SAGE/SAGE II data sets. The largest 365-day running mean O₃ changes occur in 1982-1983 in the Northern Hemisphere and in late 1984 and early 1985 in both hemispheres. Possible explanations are discussed. Two-dimensional model simulations of O₃ changes from 1979 to 1990 have been carried out. Comparisons with O₃ data are presented. Model results suggest that by 1985, significant declines in global O₃ were caused by destruction by odd nitrogen associated with long-term variations in the flux of precipitating relativistic electrons (2.6%); solar UV flux changes (1.8%); the dilution effect associated with the antarctic O₃ hole (1.2%); and atmospheric increases in CH₄, N₂O, and chlorofluorocarbons (0.4%). (Auth. mod.)

I-43648

Granier, C., Brasseur, G., **Ozone and other trace gases in the arctic and antarctic regions: three-dimensional model simulations**, *Journal of geophysical research*, Feb. 20, 1991 96(D2), p.2995-3011, Refs. p.3010-3011.

A three-dimensional mechanistic model of the middle atmosphere with calculated dynamics and chemistry is used to study the behavior of chemically active trace gases at high latitudes in winter and spring, and to simulate the formation of an ozone hole in Antarc-

tica. The chemical heterogeneous processes converting chlorine reservoirs into active chlorine in cold air masses are parameterized. The model simulates the behavior of nitrogen oxides, nitric acid, water vapor, methane, hydrogen radicals, chlorine compounds, and ozone. The ozone hole in the Southern Hemisphere can only be simulated when the heterogeneous polar chemistry is taken into account. The springtime ozone depletion over Antarctica calculated in the model is thus mostly the result of chemical removal, although the dynamics is responsible for the low temperature that triggers the large ozone loss rates. Unresolved questions are related to the strength of the vertical exchanges inside the vortex, the preconditioning of trace gases before and during the winter season, the behavior of the different trace gases as the vortex breaks down (dilution effects), accurate determination of the ozone sink inside the vortex, and a better quantitative estimation of the role of polar stratospheric clouds. (Auth. mod.)

I-43677

Parish, T.R., Bromich, D.H., **Continental-scale simulation of the antarctic katabatic wind regime**, *Journal of climate*, Feb. 1991 4(2), p.135-146, 40 refs.

Three-dimensional numerical simulations of the antarctic katabatic wind regime and attendant tropospheric circulations have been conducted over the entire continent to depict the topographically forced drainage patterns in the near-surface layer of the atmosphere. Results of the simulation enable a mapping of katabatic wind potential and identification of coastal regions which may experience anomalously intense katabatic winds. A large upper-level cyclonic circulation forms rapidly in response to the evolving katabatic wind structure in the lower atmosphere, suggesting that the drainage circulations are an important component in prescribing the resulting circumpolar vortex. These results imply that some representation of the antarctic katabatic wind regime is necessary in general circulation models in order to properly simulate the large-scale circulations about the continent. (Auth.)

I-43678

Ledley, T.S., **Climatic response to meridional sea-ice transport**, *Journal of climate*, Feb. 1991 4(2), p.147-163, 34 refs.

A coupled energy balance climate-sea-ice model is used here to examine the effect of sea-ice transport on the ocean-atmosphere energy exchange and atmospheric temperature. The model results show that the transport of sea ice thins the pack ice in the central Arctic and around Antarctica. This thinning produces a larger lead fraction within the ice pack, a longer period of ice-free conditions near the poles, and extends the sea ice equatorward. This results in an increased transfer of energy from the ocean to the atmosphere near the poles, which through meridional energy transport produces warmer conditions at all latitudes. If the effects simulated in this study reflect the real climate system, then the results have implications for climate change on a wide variety of time scales. (Auth.)

I-43682

Lu, L., Bian, L., Zhang, Y., **Medium-range oscillation of meteorological elements at Great Wall Station, Antarctica**, *Antarctic research*, Dec. 1990 1(1), p.36-48, 7 refs.

A method of multi-spectral analysis is used to study the characteristics of surface and upper-level meteorological elements over the Great Wall Station, as well as their phase correlation, propagation of mean oscillation at 500 hPa level in the Southern Hemisphere, and their corresponding synoptic sense. The results are summed up as follows: over the subantarctic zone, quasi-weekly and quasi-biweekly oscillations are noted; in winter, the quasi-biweekly oscillation is dominant, and in summer, the quasi-weekly; from the surface to the lower stratosphere there is a distinct quasi-weekly oscillation at each isobaric surface, but the most intense oscillation appears at 200-300 hPa, and the oscillations of height and temperature are propagated downward; both in winter and in summer, the quasi-biweekly oscilla-

tions are propagated from West to East, and the mean velocity of its propagation is about 7-17 longitude/day; the quasi-biweekly oscillation and the quasi-weekly oscillation over the subantarctic zone are closely related to the activity and intensity variation of polar vortex at 500 hPa, while at 1000hPa they reflect an interaction between the circumpolar depression and the subtropical high. (Auth. mod.)

I-43687

Parish, T.R., Wendler, G., **Katabatic wind regime at Adélie Land, Antarctica**, *International journal of climatology*, Feb. 1991 11(1), p.97-107, 27 refs.

The coastal sections of Adélie Land in East Antarctica experience the strongest and most persistent slope (katabatic) winds recorded about the continental periphery. The area was first explored during Mawson's 1911-14 Australasian Antarctic Expedition; the annual average surface wind speed at the base camp of Cape Denison was approximately 20 m/s during the course of the 2-year stay in Antarctica. Field traverses conducted by the Mawson group and the subsequent establishment of additional bases and more recent deployment of automatic weather stations suggest that the zone of extreme katabatic winds is not confined to the Cape Denison site, but rather extends several hundred kilometers inland from the coast and at least 60 km west along the coast. Numerical simulations of the Adélie Land katabatic wind regime have been conducted using a primitive equation three-dimensional model. Results confirm the extreme wind conditions over the Adélie Land region and strongly suggest that the confluence of cold air drainage currents from the interior towards Adélie Land is responsible for the anomalous katabatic wind intensity. (Auth.)

I-43689

Yang, H., Olaguer, E., Tung, K.K., **Simulation of the present-day atmospheric ozone, odd nitrogen, chlorine and other species using a coupled 2-D model in isentropic coordinates**, *Journal of the atmospheric sciences*, Feb. 1991 48(3), p.442-471, 82 refs.

The 2-D model utilizes all zonally averaged physical equations of momentum, energy and mass, and self-consistently determines both its advective and diffusive transport parameters from the observed temperature specific to the period of observation. A major assumption in the formulation is that diffusive mixing is caused by large-scale planetary waves which act predominantly along isentropic surfaces. It is also assumed that it is planetary waves that drive the stratosphere away from radiative equilibrium, resulting in diabatic vertical and meridional advective transport. It is in this way that energy, momentum and tracer budgets are interconnected. Family approximation is used, and the transported species include O_x , NO_y , N_2O , Cl_y , CH_4 , CO , CFCs and HF. Partition within a family is calculated assuming photochemical equilibrium. Diurnal variation of nitrogen species is obtained by solving an ordinary differential equation analytically. The comparison of the model result with observations is very favorable. Some previously known common model deficiencies have largely been overcome. Simulation of climatological ozone, including the details of seasonal, latitudinal and vertical distributions, is especially successful using the present coupled model. The problem of NO_y deficit in the equatorial lower stratosphere also appears to have been resolved, and a correct latitudinal profile for nitric acid column is obtained. Physical reasons are given for the improvements in the model results, and possible explanations for the remaining systematic deficiencies, now occurring mostly in the model upper stratosphere and mesosphere, where breaking gravity waves may become an important transport process. Graph data throughout the essay extend through both polar regions to about 85N and S latitudes, thus allowing a continuous comparison of the two areas. (Auth. mod.)

I-43690

Shiotani, M., **Low-frequency variations of the zonal mean state of the Southern Hemisphere troposphere**, *Meteorological Society of Japan. Journal*, Aug. 1990 68(4), p.461-471, With Japanese summary. 26 refs.

This paper presents an observational study of the low-frequency variation in the Southern Hemisphere troposphere using the global analyses for 1980-85. An empirical orthogonal function (EOF) analysis is made for the zonal mean geopotential height at 1000 mb to capture the variation. Based on time series of the second EOF coefficients, which represent the dominant non-seasonal low-frequency variation in the Southern Hemisphere, four typical events are defined: negative extreme (D-), positive extreme (D+), negative to positive transition (T+), and positive to negative transition (T-) events. Hemispheric variations of these events are described in terms of maximum westerly circulation, storm activity, temperature changes, intensities of the variations, and the speed with which latitudinal variations are accomplished. The bulk of the activity described occurs in subantarctic latitudes. (Auth. mod.)

I-43694

Prabhakara, C., Yoo, J.M., Dalu, G., Fraser, R.S., **Deep optically thin cirrus clouds in the polar regions. Part I: Infrared extinction characteristics**, *Journal of applied meteorology*, Dec. 1990 29(12), p.1313-1329, 31 refs.

The spectral data obtained by the Infrared Interferometer Spectrometer (IRIS) flown on a Nimbus 4 satellite in 1970 indicated the existence of optically thin ice clouds in the upper troposphere that probably extended into lower stratosphere, in the polar regions, during winter and early spring. The spectral features of these clouds differ somewhat from those of the optically thin cirrus clouds in the tropics. From theoretical simulation of the infrared spectra in the 8-25 micron region, it is inferred that these polar clouds have a vertical stratification in particle size, with larger particles (about 12 micron) in the bottom of the cloud and smaller ones (about 1 micron) aloft. Radiative transfer calculations also suggest that the equivalent ice-water content of these polar clouds is of the order of 1 mg/sq cm. (Auth.)

I-43703

Ma, C., **Study on the composition of atmospheric aerosol over the Great Wall Station, Antarctica**, *Antarctic research*, 1990 2(2), p.36-43, In Chinese with English summary. 9 refs.

Aerosol samples were collected at the Great Wall Station by cascade impactors; each sample provided 8 particle size fractions in the normal aerodynamic diameters (micron) ranges. The samples were analyzed by the Proton Induced X-ray Emission (PIXE) method. The X-ray spectra were analyzed by computer, with small peaks being checked by manual integration to obtain the final concentrations. The data are given in microgram/standard cu m. In order to learn the enrichment factors of various elements, the results were separated into two groups: coarse and fine particles. Coarse mode (> 10 micron) concentrations were compared with the composition of the earth's crust. The fine mode of elements shows large relative enrichments. (Auth. mod.)

I-43704

Zhu, G., **Study on atmospheric aerosol over Great Wall Station during austral summer, 1987**, *Antarctic research*, 1990 2(2), p.44-50, In Chinese with English summary. 5 refs.

Atmospheric aerosol samples, collected by an 8 stage cascade impactor sampler over the Great Wall Station during Jan. 8-Feb. 19, 1987, were analyzed by the PIXE method. A size distribution of mass concentration of 18 elements was obtained. The enrichment factors of various elements in the aerosol relative to the earth crust and the sea water with salinity of 35.0 per mill, were calculated. The en-

richment factors of elements Mn, Fe, Si, Ti and Pb are approximately 1 relative to the earth crust, indicating that these elements mainly come from the soil. The common characteristic of size distribution is that the concentrations increase when larger than 8 microns. The enrichment factors of elements K, Ca, Cl, S, Sr, and Br are approximately 1 relative to sea water, which indicates that these elements mainly come from marine aerosols and distribute in the range of 1-8 microns. The enrichment factor of various elements in the stage 0 (particle size less than 0.25 micron) grow relatively larger, which shows that the contribution of anthropogenic pollution increases. Characteristics of size distribution of the aerosol mass concentration over the Great Wall Station suggest that the anthropogenic contaminants of super-fine size are mainly transmitted from remote continents. (Auth. mod.)

I-43706

Zou, H., **Stratospheric sudden warming and its relationship with ozone in Antarctica in August, 1988**, *Antarctic research*, 1990 2(2), p.61-66, In Chinese with English summary. 11 refs.

Variations in total ozone, 30 hPa temperature, 30 hPa 24-hour temperature, and westerly wind are studied from data provided by JARE-29. Preliminary analysis shows a sudden warming in the lower stratosphere over Showa Station, in which the 30 hPa temperature increases by 40.9 C in Aug. 26-30, 1988, and a maximum 24-hr warming reaching 21.7 C/day. Good correlations between 30 hPa temperature, 30 hPa westerly wind and total ozone in this sudden warming period are found. In the period of Aug. 15-Sep. 6, 1988, the correlation coefficient of 30 hPa temperature is 0.96 with total ozone, and 0.88 with 30 hPa westerly wind. It is suggested that the ozone heating effect is not the cause of the sudden warming during the above period, but that the ozone variations are caused by circulation fluctuations due to the sudden warming. Further data show that the all-layer westerly wind occurs about Aug. 22, 1988, or 5 days before the occurrence of the sudden warming, which implies the possibility that the direct cause of the warming is the upward transfer of the planetary wave in the troposphere. (Auth. mod.)

I-43707

Zhang, Y., Lu, L., **Review of the study of antarctic ozone hole**, *Antarctic research*, 1990 2(2), p.67-80, In Chinese with English summary. Refs. p.77-78.

Based on the available literature on the antarctic ozone hole, three interpretations on the ozone depletion are reviewed in this paper. They involve analysis of atmospheric dynamics, solar activity and anthropogenic activities with the following conclusion: the internal cause for the formation of the ozone hole might be that the reactive chlorine radical, produced by the heterogenous reactions on the surface of PSCs, destroys the ozone molecules by photochemical reactions in the stratosphere; the external cause might be the general atmospheric circulation conditions in the years that ozone depletion occurred. It is suggested that the ozone hole may continue to exist, as the chlorine in the air is not destroyed in the chlorine catalytic photochemical reaction cycles, but its depth and area should vary with oscillations of the atmospheric circulation. (Auth. mod.)

I-43723

Joshi, P.V., **Background levels of atmospheric ions**, *Current science*, Aug. 10, 1990 59(15), p.737-738, 12 refs.

Results of surface measurements of atmospheric ions over southern oceans and at an oasis in Antarctica reveal that the average background levels of both positive and negative atmospheric ions are in the range of 100-200 ions/cu cm when average Aitken nuclei concentration was around 200-300 particles/cu cm. The levels are compared with those found over clean and polluted continental and oceanic atmospheres. It is felt that in the assessment of background levels of atmospheric ions, the concentrations of both ions and Aitken nuclei should be considered. (Auth.)

I-43736

Schlesinger, M.E., Jiang, X., **Revised projection of future greenhouse warming**, *Nature*, Mar. 21, 1991 350(6315), p.219-221, 8 refs.

Using a simple climate/ocean model, the authors make projections for four greenhouse-gas warming scenarios, whose radiative effects in 2100, expressed in terms of an equivalent amount of CO₂, ranged from 2 to 5.5 times the pre-industrial CO₂ concentration. All projections are revised by prescribing a lower value for a key parameter of the simple ocean model, P_i , which indicates the warming of the polar ocean relative to the warming of the non-polar ocean. For any value of ΔT_{2x} , the atmospheric temperature increases more rapidly with time as a consequence of the reduction in P_i . A delay of ten years in initiating a 20-year transition from the IPCC 'business-as-usual' scenario to any other IPCC scenario has only a small effect on the projected warming in 2100, regardless of the value of ΔT_{2x} . This indicates that the penalty for a 10-year delay is small. (Auth. mod.)

I-43737

Prospero, J.M., Savoie, D.L., Saltzman, E.S., Larsen, R., **Impact of oceanic sources of biogenic sulphur on sulphate aerosol concentrations at Mawson, Antarctica**, *Nature*, Mar. 21, 1991 350(6315), p.221-223, 28 refs.

Sulphate is the dominant aerosol species in the antarctic atmosphere and an important constituent in antarctic snow and ice. Various sources have been suggested for antarctic non-sea-salt sulphate: volcanic emissions, stratospheric injection, pollutants transported from the low latitudes, and biogenic dimethylsulphide (DMS) from the ocean. Although the oceanic source is now believed to be especially important, there has been no strong chemical evidence directly linking oceanic DMS with the Antarctic n.s.s. sulphate concentrations. Here are presented extended measurements from the Antarctic for both n.s.s. sulphate and methanesulphonate (MSA), an oxidation product of DMS. Both species have a very strong seasonal cycle with a maximum in the austral summer; this cycle parallels that of the oceanic biogenic sulphur producers, thereby suggesting a strong link between the antarctic atmospheric sulphur cycle and biological processes in the southern ocean. (Auth.)

I-43753

Zhang, S., Li, Q., Zhu, C., Kong, F., **Spectral distribution of solar radiation on Antarctica**, *Antarctic research*, 1990 2(3), p.57-60, In Chinese with English summary. 17 refs.

In this paper an instrument, its principles, and method for measurement of solar radiation at the Great Wall Station are described, and the results obtained are given. The IAU solar irradiance, the curve of solar radiation spectral distribution, and solar constants are derived and discussed briefly. (Auth.)

I-43759

Murphy, D.M., **Ozone loss rates calculated along ER-2 flight tracks**, *Journal of geophysical research*, Mar. 20, 1991 96(D3), p.5045-5053, 33 refs.

Local ozone loss rates due to the ClO + ClO and BrO + ClO cycles are calculated using ClO, pressure, and temperature from in-situ aircraft measurements and representative BrO mixing ratios. Ozone loss during the vertical profiles executed by the ER-2 near 72S usually extended over a deep altitude range rather than reaching a maximum at the top of the profiles. This is due to the strong pressure dependence of the rate determining steps. In the Antarctic, very high ozone loss rates (> 5 million cu cm/s) were observed at altitudes with potential temperatures below 400 K, where advective exchange is likely to be much more rapid than at higher altitudes. On Sep. 22, 1987, the ER-2 measured an ozone loss rate of about 2.8 Dobson units (DU) per 12 sunlit hours in the 350-400 K range and 2.0 DU in the 400-450 K

range near 72S. Rapid ozone loss in the Arctic did not extend below 400 K in the available data. Adiabatic temperature changes of up to 10 K change the ozone loss rate by less than 10% because the temperature and pressure effects nearly cancel. Thermal decomposition of Cl₂O₂ was not important along sunlit portions of ER-2 flight tracks if equilibrium is assumed between ClO and Cl₂O₂. The effect of recalibration of the ClO data on the calculated loss rates is discussed. (Auth. mod.)

I-43760

Jackman, C.H., **Impact of interannual variability (1979-1986) of transport and temperature on ozone as computed using a two-dimensional photochemical model**, *Journal of geophysical research*, Mar. 20, 1991 96(D3), p.5073-5079, Refs. p.5078-5079.

Eight years of NMC (National Meteorological Center) temperature and SBUV (solar backscattered ultraviolet) ozone data were used to calculate the monthly mean heating rates and residual circulation for use in a two-dimensional photochemical model in order to examine the interannual variability of modeled ozone. Large interannual changes in tropospheric dynamics are believed to influence the interannual variability in the total ozone, especially at middle and high latitudes. Since these tropospheric changes and most of the QBO forcing are not included in the model formulation, the interannual variability in total ozone is not well represented in the model's computations. (Auth. mod.)

I-43762

Stone, R.S., Kahl, J.D., **Variations in boundary layer properties associated with clouds and transient weather disturbances at the South Pole during winter**, *Journal of geophysical research*, Mar. 20, 1991 96(D3), p.5137-5144, 23 refs.

Radiation and meteorological data collected at the South Pole during the 1986 austral winter are analyzed to gain a better understanding of the relationships between cloud radiative effects, transport processes and the vertical distribution of temperature and wind. An algorithm is developed to characterize the quasi-permanent surface-based temperature inversion and the "warm" radiatively active layer above it. Mean winter temperature and wind profiles for clear and overcast conditions are combined with surface radiation measurements and synoptic circulation patterns to study the mechanisms that cause periodic weakening of the inversion. Results support previous studies that ascribe this weakening to warm air advection, downward vertical mixing of sensible and latent heat, and longwave cloud radiative heating. The integrity of the inversion depends on the combined effects of all three mechanisms. Parameters representing the intensity of the inversion and the bulk wind shear through the lower troposphere are suggested as appropriate indices for the detection of climate change in the region of the Antarctic Plateau. (Auth. mod.)

I-43810

Kitoh, A., Yamazaki, K., Tokioka, T., **Double-jet and semi-annual oscillations in the Southern Hemisphere simulated by the Meteorological Research Institute general circulation model**, *Meteorological Society of Japan. Journal*, Apr. 1990 68(2), p.251-264, With Japanese summary. 35 refs.

Performance of a 12-year integration with the Japan Meteorological Research Institute general circulation model is presented and compared with the observation for the period 1979-1987. The simulated meridional temperature gradient in July has two distinctive maxima, one at 30S in the upper troposphere and the other at 60S in the lower troposphere, and the baroclinity is not zonally uniform. The simulated zonal winds at 500 mb show two jets in the Pacific sector, one at 30S and the other at 60S, and only one jet in the Atlantic/Indian

sector, in accordance with observation. The double-jet structure is somewhat obscured when taking the zonal mean. Quasi-stationary eddy fields with zonal wavenumber 1 at 50-70S are associated with this zonal asymmetry. Even in the Pacific sector two strong baroclinic zones occur only from May to Oct., while there is one during the rest of the year. Between 50S and 60S, baroclinity becomes strong during spring and fall, and semi-annual oscillations are found in zonal wind and sea-level pressure. A good simulation of the seasonal cycle of the antarctic temperature field such as a rapid cooling in autumn of the antarctic lower troposphere, lack of a well defined temperature minimum (the coreless winter) and coldest atmosphere in early spring, is crucial to a successful simulation of the semi-annual oscillations and the winter double-jet structure. (Auth.)

I-43831

Wei, D.W., **On the formation of the antarctic ozone hole and its trend predictions**, *Science in China*, Jan. 1991 34(1), p.95-103, 13 refs.

The relationships between the solar activities and a great amount of O₃ data have been analyzed in more detail. It seems that there are "sensitive areas" and "non-sensitive areas" existing in the total ozone responding to the influence of the 11-year solar cycle. The responses are stronger in the higher latitudes and the winter-spring period than those in the lower latitudes and the summer-autumn period. Accordingly, in addition to the Chapman process, which is the main one, there should be a secondary process for controlling the stratospheric ozone layer. Therefore, a new viewpoint of the formation of the antarctic ozone hole is presented and its trend in the future years is predicted. (Auth.)

I-43843

Gobbi, G.P., Adriani, A., Viterbini, M., **Polar stratospheric clouds and ozone depletion: relevance of extended *in situ* observations**, *Il nuovo cimento*, May-June 1990 13(3), p.599-616, 55 refs.

The occurrence of a springtime ozone depletion over Antarctica appears to be the result of a chain of processes leading to catalytic destruction of the gas by the action of halogen radicals, in particular chlorine oxide. High abundances of ClO in the stratosphere are determined by abnormally low concentrations of nitrogen compounds; such denitrification is likely to be caused by heterogeneous reactions and transport carried out by the clouds present in the polar stratosphere. Stratospheric clouds form during most of the winter and the beginning of spring over the polar regions. Due to scarce accessibility, knowledge of their properties is still poor. Information on extent, particle shape and size distributions is, however, fundamental for the understanding of the magnitude of their contribution to the destruction chain. A balloon-borne experiment, aimed at the *in situ* observation of cloud particles from 2 to 200 microns in radius, is presented. This would be the first system to provide on-line TV images of cloud particles. (Auth.)

I-43846

Styszyńska, A., **Effect of wind direction and orography on air temperature at the Arctowski Station**, *Polish polar research*, 1990 11(1-2), p.69-93, 13 refs.

The frequency of wind occurrence, as well as mean air temperature with a particular wind direction, was measured for the warmest (1985) and the coldest (1980) year of the investigation period 1978-1987 at Arctowski Station. The effect of orography on wind direction and air temperature was determined. A great dependence of air temperature and wind direction upon atmospheric circulation was found. High air temperature at winds from 300 deg and 330 deg directions is related both to the kind of air mass and the foehn phenomena. (Auth.)

I-43852

Enomoto, H., **Fluctuations of snow accumulation in the antarctic and sea level pressure in the Southern Hemisphere in the last 100 years**, *Climate change*, Jan. 1991 18(1), p.67-87, 40 refs.

This paper summarizes the long-term fluctuations of snow accumulation in the Antarctic and analyzes its correlation with the sea level pressure (SLP) in the middle latitudes of the Southern Hemisphere. Stratigraphic data which were compiled from studies on ice cores and snow-pits at eight stations in the Antarctic were used in the present study. Data concerning fluctuations in snow accumulation for East Antarctica showed correlations, whereas no such correlation was observed for the data from West Antarctica. This study shows possible relationships between snow accumulation in the Antarctic and SLP in the middle latitudes. The fluctuations of accumulation at South Pole, Dome C, Wilkes and South Ice Point show correlations with SLP over a large area in the 40-50S latitudinal zone. For the long-term fluctuations of SLP in the 40-50S latitudinal zone, a zonal fluctuation with wave number zero structure and a longitudinal variation of SLP anomalies due to their out-of-phase-fluctuation between the Pacific and the Indian Oceans were observed. The temporal scales for these fluctuations were found to be in the order of 20-30 years and 40-60 years, respectively. The influences of these two modes on the behavior of snow accumulation in the Antarctic is also discussed. (Auth.)

I-43855

Repnev, A.I., **Anomaly in ozone distribution in the Antarctic** [Anomaliia v raspredelenii ozona v Antarktike], *Antarktika; doklady komissii*, 1990 No.29, p.5-26, In Russian with English summary. Refs. p.24-26.

A review is presented of some papers dealing with discovery, description and possible explanation of the reduction of total ozone content in the antarctic spring. Evidence is presented concerning the behavior of total ozone, vertical distribution of ozone, some minor constituents of the atmosphere, temperature, polar stratospheric clouds, etc. during the period of anomaly. Different ideas explaining the existence of this anomaly for various dynamic and chemical reasons are discussed. (Auth.)

I-43856

Bugaeva, I.V., Tarasenko, D.A., Shikunova, G.B., **Temperature and circulation of the middle atmosphere over the Antarctic in winter-spring period** [Temperatura i tsirkuliatsiia srednei atmosfery nad Antarktikoi v zimnevesennii period], *Antarktika; doklady komissii*, 1990 No.29, p.27-33, In Russian with English summary. 10 refs.

An analysis is presented of temperature deviations for several recent winters from long period averages of the rocket data obtained at Molodezhnaya Station. Results show that the antarctic winter of 1988 was characterized by an unusually warm stratosphere. Spring circulation changes took place very early for high latitudes of the Southern Hemisphere. (Auth. mod.)

I-43857

Tarasenko, D.A., **Differences in temperature, wind and geopotential latitudes of the Arctic and antarctic stratosphere and mesosphere** [Razlichiiia v poliakh temperatury, vetra i geopotentsial'nykh vysot antarkticheskoi i arkticheskoi stratosfery i mezofery], *Antarktika; doklady komissii*, 1990 No.29, p.33-40, In Russian with English summary. 7 refs.

The paper deals with the verification of specific features of inter-hemispheric differences in the stratosphere and mesosphere. For this

purpose, new sets of data generalized in the form of atmospheric models have been used. Results show higher wind velocities at high latitudes of the Southern Hemisphere, related to deeper winter cyclones and more intense summer anticyclones, than in the Northern Hemisphere. (Auth. mod.)

I-43858

Kovshova, E.N., Koshel'kov, I.U.P., **Temperature variability in the Southern Hemisphere stratosphere from satellite data** [Izmenchivost' temperatury v stratosfere IUzhnogo polushariia po sputnikovym dannym], *Antarktika; doklady komissii*, 1990 No.29, p.40-46, In Russian with English summary. 3 refs.

Using the correlation between atmospheric radiances and atmospheric temperatures at the level of maximum radiance, temperature values were estimated on constant-pressure levels of 5 and 1 mb. The temperature variability was then estimated (standard deviations, deviations for certain probabilities). Latitudinal and seasonal variations of the variability parameters were analyzed for the upper stratosphere. A comparison of satellite and rocketsonde-based parameters was made. The displacement of maximum variability values in the middle stratosphere towards late winter and spring was confirmed. (Auth.)

I-43897

Kolosova, N.V., Uranov, E.N., Eremin, V.N., Demidenko, N.L., **Air transport features at the Russkaya and Leningradskaya Stations** [Osobennosti vozdukhoperenosa na antarkticheskikh stantsiiakh Russkoi i Leningradskoi], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.40-48, In Russian. 4 refs.

Data are discussed and presented in tables showing monthly values and yearly averages of circulation intensity and air mass transport, and frequency of wind direction and speed averages, obtained at Russkaya and Leningradskaya Stations in 1986.

I-43898

Radionov, V.F., **Integral transparency and aerosol optical thickness of the atmosphere at Mirnyy Station** [Integral'naia prozrachnost' i aerol'naia opticheskaiia tolshcha atmosfery v observatorii Mirni], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.48-51, In Russian. 5 refs.

Measurements of atmospheric aerosol thickness and integral transparency, obtained at Mirnyy Station between 1980 and 1987, are presented in tables and analyzed. It is noted that seasonal changes of the integral transparency coefficient are related not only to humidity variations but to aerosol turbidity as well. Maximum aerosol thickness was recorded in Jan. 1983; minimum transparency values were recorded for the same period.

I-43899

Dianov-Klokov, V.I., Malkov, I.P., Radionov, V.F., IURganov, L.N., **Carbon monoxide in the antarctic atmosphere** [Okis' ugleroda v atmosfere Antarktidy], *Sovetskaia antarkticheskaiia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.51-55, In Russian. 6 refs.

The follow-up study is discussed of an investigation on atmospheric carbon monoxide (CO) concentrations, begun in 1977-1978, at Molodezhnaya Station, and continued in 1982 at Mirnyy Station. Tabulated results and graphs of measurements obtained in 1977-1978 and 1982-1987 are presented and analyzed. The integral values of CO content show a seasonal pattern, with minimal values at the end of summer, and maximum values at the beginning of spring.

I-43909

By radio from Antarctica [Po radio iz Antarktiki], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.116-117, In Russian.

A month-to-month table is presented with meteorological data—atmospheric pressure and temperature, wind speed, relative humidity, cloudiness and mean height reached by radiosondes—recorded at each of the 7 Soviet stations from July through Dec., 1988.

I-43910

Barnola, J.M., Pimienta, P., Raynaud, D., Korotkevich, Y.S., **CO₂-climate relationship as deduced from the Vostok ice core: a re-examination based on new measurements and on a re-evaluation of the air dating**, *Tellus*, Apr. 1991 43B(2), p.83-90, 20 refs.

Interpretation of the past CO₂ variations recorded in polar ice during large climatic transitions requires an accurate determination of the air-age difference. For the Vostok core, age differences resulting from different assumptions on the firn densification process are compared, and a new procedure is proposed to date the air trapped in this core. The penultimate deglaciation is studied on the basis of this new air dating and new CO₂ measurements. These measurements, and results obtained on other ice cores, indicate that at the beginning of the deglaciations, the CO₂ increase is either in phase or lags by less than about 1000 years with respect to the antarctic temperature, while it clearly lags the temperature at the onset of the last glaciation. (Auth. mod.)

I-43911

Staffelbach, T., Stauffer, B., Sigg, A., Oeschger, H., **CO₂ measurements from polar ice cores: more data from different sites**, *Tellus*, Apr. 1991 43B(2), p.91-96, 13 refs.

Air in the bubbles of polar ice has in principle the same composition as the atmospheric air at the time of ice formation. Based on this relationship, an increase in atmospheric CO₂ since the beginning of industrialization has been documented in antarctic ice cores. In this paper, small deviations of the CO₂ concentration in air bubbles from that of the atmosphere at the time of enclosure are discussed. New results from Crête (Central Greenland) ice cores covering the period since the beginning of industrialization are presented, showing a good agreement with the data from antarctic ice cores. In addition, the record of the atmospheric CO₂ concentration during the transition from the last glaciation to the Holocene, and the rapid variations in the concentration of atmospheric CO₂ during parts of the last glaciation, as suggested by Greenland ice core data, is discussed. (Auth. mod.)

I-43912

Nakazawa, T., **Concentration of atmospheric carbon dioxide at the Japanese antarctic station, Syowa**, *Tellus*, Apr. 1991 43B(2), p.126-135, 23 refs.

Continuous measurements of the atmospheric CO₂ concentration have been made at Showa Station since Feb. 1984. The diurnal CO₂ variation was hardly observable throughout the year. The secular CO₂ trend was variable with time, showing slow increase in 1984, 1986 and 1988 and rapid increase in 1985 and 1987. The annual CO₂ increase was especially large in 1987, which may be related to the 1986/87 ENSO event. The average rate of annual CO₂ increase over the last 5 years was about 1.6 ppmv/yr. The average seasonal CO₂ cycle showed minimum and maximum concentrations in mid-Apr. and early in Oct., respectively, and its peak-to-peak amplitude was about 1.1 ppmv. The measured seasonal cycle was variable from year to year, but there was no indication of a long-term increase of the amplitude. It was found that irregular CO₂ variations, with amplitudes of 0.2 ppmv at most and periods of a few weeks, show high correlation with air mass exchange by synoptic scale weather disturbances. The results from Showa are compared with those from the South Pole and Cape Grim, Tasmania. (Auth.)

I-43913

Aoki, S., Kawaguchi, S., **Development of a high quality system for continuous measurement of atmospheric methane concentration**, *Antarctic record*, Nov. 1990 34(3), p.263-278, In Japanese with English summary. 16 refs.

A GC/FID system for *in situ* continuous measurements of atmospheric CH₄ concentration was developed. A precision to $\pm 0.07\%$ was achieved by improving the gas flow lines and electric circuit of the commercial gas-chromatograph, and also by the calibration method. The standard gases of CH₄ in air mixture were prepared by the gravimetric method using an extremely precise balance; the absolute accuracy of the CH₄ concentration was estimated at within $\pm 0.2\%$. A chart is presented showing stability of CH₄ concentration of the working standard gases used at Showa Station during Feb. 1988-Jan. 1989.

I-43947

Ohtani, S., Kanda, H., Ino, Y., **Microclimate data measured at unmanned observation station, the Yukidori Valley, Langhovde, Antarctica in 1988-1989**, *Japanese Antarctic Research Expedition. JARE data reports*, Mar. 1991 No.163, 99p., 2 refs.

A survey of biological meteorology was undertaken by JARE-27 and 29, from 1986 to 1989. The survey was carried out in the Langhovde Hills region as part of the research project "Studies on the mechanism of the antarctic terrestrial ecosystems." Operations involved meteorological observations near the biological hut, microclimate observations along the stream in the Yukidori Valley, and unmanned microclimate observations near the hut. This volume is the 2nd report of the 3 microclimate studies. It deals with the microclimate data measured daily at the unmanned observation station near the hut from Jan. 1988 to Jan. 1989. Wind direction and speed, radiation, air temperature, relative humidity, and temperatures at the moss and rock levels were determined. The resulting charts are presented. Instruments and methods used are described.

I-43951

Villela, R.J., **Radio weather transmissions in the Antarctic**, *Polar record*, Apr. 1991 27(161), p.103-114, 32 refs.

During 7 summer Brazilian expeditions to the Antarctic Peninsula, the author used radio weather transmissions to collect data for synoptic analysis and operational weather forecasting. A particularly intensive effort aboard *Barão de Teffé* in 1989-90 yielded detailed information on frequencies, schedules, procedures and contents, which should be useful to radio-operators, meteorologists, and other antarctic workers. Because of unreliable reception of regular fax and teletype broadcasts, synoptic reports were copied directly by monitoring voice and Morse point-to-point circuits, gaining time crucial to operational decisions. Especially useful sources of reports were the Frei, Marambio, and Faraday collections, and the USSR radiotelegraph communications carrying land and ship reports for all sectors of Antarctica and the southern ocean. An insight into weather conditions on the Antarctic Plateau, as well as a sense of history in the making, were gained by monitoring Adventure Network International's radio frequencies. (Auth. mod.)

I-44006

Meshida, S., Azuma, N., Yukimatsu, A., Yamanouchi, T., **Meteorological data at Asuka Station, Antarctica in 1989**, *Japanese Antarctic Research Expedition. JARE data reports*, Mar. 1991 No.164, 110p., 1 ref.

This report contains the surface synoptic data obtained by JARE-30 in 1989. The automatic meteorological observation system was installed at Asuka Station in Jan. 1987; an illustration is presented of the system in the form of a block diagram. Tables show the follow-

ing: sensor specifications; monthly and daily meteorological data summaries; surface synoptic data; and hourly global solar radiation, from Jan. through Dec. 1989.

I-44008

Konishi, H., Wada, M., **Antarctic climate research data. Part 3: Radar and microwave radiometer data at Syowa Station, Antarctica, in 1989, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1991 No.165, 111p., For Part 1 and 2 see: 17I-39618 and 18I-41879, respectively. 4 refs.

A 5-yr program of Antarctic Climate Research has been carried out at Showa, Asuka and Mizuho Stations, and the surrounding ice sheet and sea ice areas by JARE since 1987. The main research subjects are: interannual variation of the antarctic atmosphere; sea ice-atmosphere interaction; variation of the ice sheet and the ice shelf; and ice core analysis. In JARE-29 and -30, the 2nd and 3rd year of this program, the items mainly observed were related to the interannual variation of the antarctic atmosphere. The observational data of clouds and precipitation in 1989 are shown in this report. Instrumentation used in the observational program and data reduction are discussed. The data in the various tables, figures and graphs are explained.

I-44009

Wada, M., Yamanouchi, T., Konishi, H., **Antarctic climate research data. Part 4: 37 GHz microwave radiometer data in 1987-1989 and shortwave and longwave radiation data in 1988 at Syowa Station, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1991 No.166, 82p., For Part 1, 2 and 3 see: 17I-39618, 18I-41879 and I-44008, respectively. 7 refs.

In the first three years of this program, JARE-28, -29 and -30, the items related to the interannual variation of the antarctic atmosphere have been extensively observed. Some of the items were radiation components from the atmosphere, in the visible, infrared and microwave wavelength regions. Observations of radiation components were made on the ground surface at Showa Station, aiming to obtain the radiation budget and cloud information, especially liquid water content. Data of the global solar radiation and downward longwave radiation in 1988, and the brightness temperature measured by the 37 GHz radiometer in 1987, 1988 and 1989, are presented in tables. Instruments used in the program are discussed.

I-44011

Colacino, M., ed, Giovanelli, G., ed, Stefanutti, L., ed, **Italian Research on Antarctic Atmosphere, 2nd Workshop, Porano, Oct. 19-20, 1989, Conference proceedings of the Italian Research on Antarctic Atmosphere, Vol.27**, Bologna, Italian Physical Society, 1990, 345p., Refs. passim. For selected papers see I-44012 through I-44036, I-44038 and K-44037.

This is a collection of papers presented at the 2nd Workshop of Italian Research on Antarctic Atmosphere, held Oct. 19-20, 1989, in Porano, Italy. It consists of more than 30 reports, including abstracts, divided into three sections: strictly scientific results from research of the troposphere and the stratosphere, and the more technical contributions concerning the installation of meteorological networks, logistics, meteorologic instruments and observation techniques. The tropospheric research reports deal with the physics of the planetary boundary layer, measurements of minor atmospheric constituents, the meteorology of katabatic winds and the characterization of the surface layer. The stratospheric research reports deal mainly with the problem of ozone depletion. An important contribution of the Italians in this field is seen in the development of new instruments suitable for operation under polar conditions such as, for example, the lidar systems and the differential spectrophotometer.

I-44012

Bromwich, D.H., **International cooperative studies of the antarctic planetary boundary layer**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.19-25, 17 refs.

An overview is presented of recent antarctic boundary-layer research projects that are characterized by significant international collaboration. For convenience, the studies are grouped into the following classes: major coordinated field programs; projects involving exchange of data or logistic support; and coordination of parallel investigations. Some thoughts are offered on ways to enhance future field measurement programs. (Auth.)

I-44013

Georgiadis, T., Bonasoni, P., Giovanelli, G., **Characterization of atmospheric surface layer at the Campo Icaro base in Antarctica: a case study**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.35-44, 5 refs.

During the Italian antarctic expedition of 1988-1989, measurements of micrometeorological variables and trace constituents of the atmosphere were performed in order to initiate the characterization of the surface layer at Campo Icaro base. Profiles of vertical wind intensity and ozone concentration show a periodicity of about 1.5 hour, correlated with the quasi-permanently superadiabatic temperature gradient of the surface layer. Typical of a strong convective regime, the vertical motion of air masses shows a small-scale vertical transport due to the soil-atmosphere heat exchange. The data collected by the profile method in the lowest layer are compared to Doppler sodar observations at Nansen Glacier. (Auth.)

I-44014

Morandi, M., **Experimental Cloud Lidar Pilot Study (ECLIPS): the 1989 campaign at Dumont d'Urville**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.45-60, 24 refs.

A depolarization lidar was installed at Dumont d'Urville Station in Jan. 89, and routine cloud measurements are performed there in order to collect a set of statistical data. Two ECLIPS campaigns have been carried out. Continuous IR downward radiance measurements are performed by a wide field of view standard radiometer, while a TV camera and a time lapse video recorder are used to monitor cloud cover and to estimate cloud velocity vector. Ground level and radiosonde data of meteorological parameters, and AVHRR and TOVS satellite data are available. Visible optical properties of clouds have been obtained from lidar profiles. Approximate values of cloud IR emissivity have been computed using lidar, radiometric and radiosonde data. (Auth.)

I-44015

Santachiara, G., Prodi, F., Vivarelli, F., Vitale, V., **Aerosol characterization and snow chemistry at Terra Nova Bay**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.61-72, 24 refs.

Condensation nuclei (CN) concentrations were measured at Terra Nova Bay with an alcohol-based particle counter. In Jan. 1989, the mean value for CN was 490. Aerosol particles were sampled by a high flow-rate inertial spectrometer and their number concentration, size distribution and chemical composition were determined. The two filters analyzed showed particle number concentration in the 0.1 to 1 micron radius range to be 50 and 180/cu cm and Junge distribution exponent 3.7 and 3.9. The concentrations of eight

major ions were determined from fresh snow samples. These showed that precipitation is acidic, a fact depending on H₂SO₄, HCl and HNO₃. The origin of some ions is discussed. (Auth.)

I-44016

Mastrantonio, G., Ocone, R., Argentini, S., Fiocco, G., **Aspects of the antarctic boundary layer observed by using a triaxial Doppler sodar**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.73-83, 9 refs.

In the last three years sodar systems with different configurations have been deployed to Antarctica and successfully operated for a total of about 100 days. Shear instabilities, strong convection, katabatic winds as well as downflow phenomena possibly associated with graupel precipitation were recorded. The statistical analysis of the wind profiles shows some characteristic features of the katabatic wind profiles and the influence of the orography on the phenomena. (Auth.)

I-44017

Anav, A., **Sampling and measurement of atmospheric CO₂ at Terra Nova Bay (Antarctica) 1989**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.85-88, 2 refs.

During the Italian expedition to Antarctica in 1988-89, the CNRIFA group "Physics of the Atmosphere" carried out some sampling and measurements to evaluate the background level of several parameters and quantities mostly involved in problems connected with the modification of atmospheric composition and climatic change. Measurements and sampling also had the aim to ascertain the possibility to operate on a continuous, or in a systematic way, at the Italian permanent base at Terra Nova Bay. (Auth.)

I-44018

Vitale, V., Tomasi, C., **Atmospheric turbidity measurements at Terra Nova Bay with the multispectral sun-photometer model UVISIR**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.89-104, 23 refs.

Measurements of direct solar irradiance were taken at 8 visible and near-infrared wavelengths using the portable sun-photometer, model UVISIR, at the Terra Nova Bay Station during Jan. and Feb. 1988 and 1989. The measurements were examined following a careful procedure which accounts for Rayleigh scattering and gaseous absorption of solar radiation and determines the values of aerosol particle optical thickness at the selected wavelengths, and then the atmospheric turbidity parameters alpha and beta. The results show that the mean daily values of alpha vary between 0.25 and 2.08 in 1988 (with a median value of 0.95) and between 0.64 and 1.62 in 1989 (with a median value of 0.88). The mean daily values of beta were found to range from 0.0003 to 0.025 in 1988 (median 0.015) and from 0.017 to 0.042 in 1989 (median 0.026). Correspondingly, the aerosol particle optical thickness was found to range from 0.02 to 0.10 at 400 nm wavelength and from 0.003 to 0.041 at 1047 nm wavelength during the overall observation period. (Auth. mod.)

I-44019

Tomasi, C., Vitale, V., Zibordi, G., **Antarctic sky diffuse radiance in sun-photometric measurements**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.105-119, 22 refs.

The sky diffuse radiance model of Zibordi and Voss (1989) was applied to an atmospheric model defined on the basis of various angular diameters of the instrument's field of view; different sun-photometric wavelengths ranging from 320 to 1050 nm; values of relative opti-

cal air mass varying from 1 to 8; appropriate estimates of the partial optical thicknesses produced by Rayleigh scattering, gaseous absorption and aerosol particle extinction; and realistic shape-parameters of the aerosol phase function, aerosol single-scattering albedo and spectral surface albedo at the Terra Nova Bay Station. This study supplies the curves of phi(lambda) calculated at the various wavelengths as a function of the angular diameter of view, relative optical air mass, atmospheric turbidity parameters and particulate optical thickness produced by aerosol particles of both maritime and continental origins. Best-fit relationship curves between phi(lambda) and the relative optical air mass have been determined corresponding to the mean values of atmospheric turbidity parameters measured at Terra Nova Bay. These curves were found to assume an exponential form at ultraviolet wavelengths and a linear form at the visible and near-infrared wavelengths, and can be usefully employed to obtain more realistic evaluations of direct solar irradiance signals from the sun-photometric output voltages. (Auth. mod.)

I-44020

Baldi, M., **Climatology analysis in the boundary layer at Terra Nova Bay, Antarctica**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.121-139, 3 refs.

The first Italian expedition to Antarctica installed a four-station network for climatological measurements in the vicinity of the Italian base at Terra Nova Bay. The data collected are used to study local climatology and some particular phenomena of the boundary layer, such as the katabatic winds. At the beginning, the weather stations consisted of mechanical instrumentation, later substituted by electronic equipment capable of year-round recording. The new weather stations and the automatic equipment installed during the 4th Italian antarctic expedition in 1987-1988 are described, and a preliminary analysis of the data collected is presented.

I-44021

Crescentini, G., Maione, M., Bruner, F., **Analytical methodology for the determination of chlorofluorocarbons in ground-level atmosphere in Antarctica**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.141-151, 16 refs.

A fast and accurate method for the determination of chlorofluorocarbons and chlorinated hydrocarbons at ppt levels in air samples is described. Samples are collected by trapping at -78 C on suitable adsorbents and injected into the gas chromatographic system by the heat-stripping technique. Analysis is performed by gas chromatography-mass spectrometry (GC-MS) and/or gas chromatography with electron capture detector (GC-ECD). (Auth.)

I-44022

Ferrario, A., **All solid state laser for automatic lidar stations**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.159-164, 6 refs.

In Antarctica, different lidar techniques have been tested for ozone concentration measurements and for understanding reaction mechanisms which deplete the ozone concentration. For this application, an automatic lidar station able to operate in all seasons is required. The present state-of-the-art of solid state lasers seems to be useful for realizing a long lifetime, low power consumption, compact and reliable laser. The design of such a laser with the specifications required for lidar applications in Antarctica is presented. (Auth.)

I-44023

Stefanutti, L., **New lidar systems: the dial and the automatic diode array pumped Nd-YAG system**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.165-175, 4 refs.

Two new lidar systems are presently being developed by the IROE Lidar research group for the Italian National Program for Antarctic Research: a complex ozone lidar, designed for both low altitude (2 km to 20 km) and high altitude ozone measurements (20 to 50 km); and an automatic diode array pumped Nd-YAG backscattering lidar, with overall power consumption of the order of 100 watts, for operation in remote areas. (Auth.)

I-44024

Tomasi, C., Vitale, V., Tagliazucca, M., Gasperoni, L., **Infrared hygrometry measurements at Terra Nova Bay**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.187-200, 18 refs.

Measurements of direct solar irradiance were taken at the Terra Nova Bay Station during Jan. and Feb. 1988 and 1989, at the 865.2, 939.0 and 1047.4 nm wavelengths, using the multispectral sun-photometer, model UVISIR. These measurements were analyzed in terms of the ratios between the sun-photometric output voltages, as suggested by the infrared hygrometry methodology, in order to determine empirically the relationship curves between these hygrometric ratios and the water vapor mass in the sun-path. The results found over the limited range of water vapor mass from 0.4 to 6.1 g/sq cm show that precise measurements of precipitable water can be obtained in the antarctic atmosphere (usually characterized by relatively dry air conditions), provided that different calibration curves are adopted within three successive subintervals of the water vapor mass. The comparison between precipitable water estimates determined with the infrared hygrometric method and those obtained from the simultaneous radiosounding measurements gives evidence of the high precision of the present technique in estimating the water vapor mass contained in a vertical atmospheric column of unit cross section. (Auth. mod.)

I-44025

Di Menno, I., **Italian observatory of climatology in Antarctica: a comparison among different places in relation to ephemerides**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.201-211.

The choice of sites for climatological observations in the vicinity of the Italian Terra Nova Bay Station, especially suited for measurements of solar activity, is discussed. Four places have been selected: Campo Meteo, Quota 280, Campo Icaro and Campo Base. They are close to Terra Nova Bay Station, electrically linked to it, and equipped with a communication system suitable for the operation of telemetering instruments during winter. The exact location, equipment and activities of each base are described; tables showing hours and percentage of solar radiation at each base are presented.

I-44026

Pellegrini, A., De Silvestri, L., Ramorino, M.C., Sarao, R., **Operational meteorological systems at Terra Nova Bay Station: present status and future plans**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.213-219.

The implementation of a Mesoscale Meteorological Network at Terra Nova Bay was started in 1985. During the following 4 expeditions, 5 automatic weather stations (AWS) were installed and some other meteorological measuring systems were tested, including radi-

osounding equipment for measuring vertical profiles of wind, temperature, pressure and humidity. During summer season 1987-1988, two radiosoundings per day were launched whenever possible, and one ozone-sounding per week is planned for the 1989-1990 season. The total number of AWS will be increased to 8 during 1989-1990. This network is coordinated with a research program conducted in the same area by the Byrd Polar Research Center of Ohio State University. In addition, another group of AWS is being implemented by the Italian Antarctic Program, to monitor climatology at local scale around the Italian station. AWS monthly summary data for Feb.-Aug. 1989 are presented in tables. Future activities, including the installation of a meteorological center at Terra Nova Bay Station during the summer of 1990-1991, are outlined.

I-44027

Mégie, G., **International cooperation in polar ozone research**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.223-226, 6 refs.

Various experiments conducted during the past 5 years have first confirmed that a large, rapid and unexpected decrease in the abundance of springtime ozone took place during the last decade over Antarctica. This total column ozone decrease reached its maximum value of 50% in the years 1987 and 1989, as confirmed by both ground-based and spaceborne observations, the latter confirming the continental spatial extent of the phenomenon. In addition, ozone-sondes launched at several stations on the antarctic continent showed that the ozone loss takes place predominantly in the 12 to 24 km altitude range. In 1987 and 1989, this altitude dependent depletion reached a maximum value of 95% at some altitudes. Results from a broad range of measurements of ozone, chlorine monoxide and bromine monoxide, carried out in field operations on an international basis, and the ozone depleting processes, are reviewed.

I-44028

Anav, A., **Total ozone measurements using a Brewer spectrophotometer at Terra Nova Bay**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.227-234, 3 refs.

A selection of ozone and sulphur dioxide data, from the Brewer spectrophotometer n.35 installed at Terra Nova Bay, is presented, and an analysis of its use, in reference to differently applied routines, is made. A rough comparison of total ozone data, obtained by the New Zealand Dobson and Italian Brewer (now at Scott Base), is attempted for the period when the ozone hole appears at its maximum. (Auth.)

I-44029

Gobbi, G.P., Andriani, A., Viterbini, M., Ugazio, S., **Polar stratospheric clouds and ozone depletion: relevance of in situ observations**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.235-238, 12 refs.

An introduction to the mechanisms for ozone destruction in the polar stratosphere is given. Cloud-induced denitrification and dehydration of the stratosphere are introduced as the priming processes for ozone loss. Knowledge of microphysical and chemical properties of these clouds is shown to be fundamental for the evaluation of the ozone destruction potential of polar stratospheric clouds. Shape of cloud particles is also demonstrated to be important in the study of these processes. (Auth.)

I-44030

Stefanutti, L., **Polar stratospheric clouds and background aerosols over Dumont d'Urville**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.239-254, 10 refs.

The IROE two-channel elastic backscatter lidar, suitable for depolarization measurements, has been operating since Jan. 8, 1989 at the Dumont d'Urville Station. A continuous monitoring of the stratosphere has been performed, which allowed measurement of the evolution of the background stratospheric aerosols and later, during the antarctic winter, the polar stratospheric clouds (PSCs). Radiosondes were launched daily. Depolarization measurements were performed, which allowed evaluation of the crystal size of the PSCs. Depolarization ratios of the order of 30 to 40% were detected, indicating large size crystals, while the temperatures, when radiosondes were available, never exceeded 193K. Probable sedimentation processes of the PSC layers were observed. Sedimentation velocities of the order of up to 500 m/h, consistent with the hypothesis of large particles, were observed. (Auth.)

I-44031

Giovanelli, G., Bonasoni, P., Evangelisti, F., **O₃ and NO₂ ground-based measurements at Terra Nova Bay, Antarctica**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.255-268, 19 refs.

Ground-based measurements of stratospheric O₃ and NO₂ were taken at the Terra Nova Bay Station, using a visible and near-ultraviolet spectrophotometer, during the summer season 1988/89. A description is given of the method used to calculate the vertical column. Results are presented of the diffused solar radiation measurements taken along the vertical path in Jan. and Feb. 1989. The measurement methodology adopted made it possible to follow the daily evolution of the column contents of the gases considered. Some of these trends are illustrated; those relative to the column content of O₃ are in strong agreement with the values obtained in the same place with an IFA-CNR Brewer spectrophotometer, while the NO₂ data can be compared with those obtained from satellites or from measurements taken in the same period in other antarctic bases. Some considerations are presented on the photochemical processes which may regulate the diurnal variation in NO₂ column content in the summer period. (Auth. mod.)

I-44032

Gardiner, B.G., **International stratospheric research at British antarctic stations**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.269-282, 14 refs.

Stratospheric measurements have been conducted at British antarctic stations for more than 30 years. The significance of the long series of total ozone determinations is described, leading to the detection of the annual spring ozone depletion which is now a recurrent feature of the antarctic stratosphere. The typical development of this phenomenon is discussed with reference to the results of a program of balloon-borne ozonesondes launched from Halley Bay in 1987. The future of spectroscopic work to measure the concentrations of related trace gases is outlined. (Auth.)

I-44033

Cacciani, M., Di Girolamo, P., Fiocco, G., Fuà, D., **Identification of polar stratospheric cloud types from lidar measurements**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.283-286, 8 refs.

A lidar system has been operating at the Amundson-Scott Station, over the antarctic plateau, since Dec. 1987 in a cooperative project between the University of Rome and NOAA/GMCC. Echoes from polar stratospheric clouds have been recorded continuously during the winter of 1988. The temperature dependence of the backscattering cross section suggests a criterion to identify the cloud type and to estimate the H₂O and the HNO₃ vapor pressures in the presence of the clouds. (Auth.)

I-44034

Goutail, F., Pommereau, J.P., Piquard, J., **Ozone depletion in the Antarctic and Arctic from ground-based observations**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.287-295, 3 refs.

Ground-based UV and visible spectrometers have been installed at the polar circles in Greenland and Antarctica, for long term stratospheric monitoring of ozone and nitrogen dioxide. After a short description of the instrument and the method developed for the interpretation of the data, the following examples of original results on polar ozone depletion are presented: the pronounced 1989 antarctic ozone hole, compared to that of 1988, and the correction of generally accepted satellite total ozone data by up to 25% in winter; the nitrogen dioxide seasonal variations which demonstrate the existence of a NO_x reservoir not included in the current photochemistry, likely nitric acid; and a demonstration of the existence of ozone depletion in the Northern Hemisphere. (Auth. mod.)

I-44035

Pitari, G., Visconti, G., Verdecchia, M., **Global ozone and the antarctic ozone hole**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.297-316, Refs. p.313-316.

The inclusion of heterogeneous reactions on polar stratospheric cloud aerosols, along with a stratospheric amount of ClO_y greater than 2-2.5 ppbv, can completely justify the phenomenology of the antarctic ozone hole. This chlorine amount can be interpreted also as a threshold for the start of a significant chemical damping at high latitudes in winter. The large ozone depletion in the antarctic spring is not completely recovered in the annual cycle, so that a global ozone loss is obtained. The model estimates presented give a global ozone depletion of about 5% from 1960 to 1985, and 8% from 1985 to 2010. (Auth. mod.)

I-44036

Pitari, G., Visconti, G., Verdecchia, M., **Effects of heterogeneous chemistry on the NO_x budget at high latitudes**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.317-337, Refs. p.334-336.

The authors review recent studies on NO_x as a factor in ozone depletion. The overall conclusion is that the NO_x-HNO₃ balance is crucial for the ozone destruction when heterogeneous mechanisms are involved. At high latitudes, and in presence of PSCs, the ozone depletion is less efficient when more NO_x has been converted to solid HNO₃. On the other hand, at mid-latitudes and in presence of volcanic aerosols, the ozone depletion is more efficient when reaction is faster.

I-44038

Adriani, A., Gobbi, G.P., Viterbini, M., Ugazio, S., **Balloon-borne experiment for observations of polar stratospheric clouds in Antarctica**, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.341-345, 6 refs.

A balloon-borne sonde for *in situ* observations of polar stratospheric cloud ice crystals larger than 3 microns is under development. The instrument uses microscopic techniques and CCD videocamera detection to provide images of the larger and most irregular constituents of polar stratospheric clouds. The sonde will be supported by a lidar to get correlative measurements on the PSCs. (Auth.)

I-44039

Shea, C.P., **Protecting life on earth: steps to save the ozone layer**, Worldwatch paper 87, Washington, D.C., Worldwatch Institute, 1988, 46p., Refs. p.38-46.

DLC TD885.5.O85S54

By the antarctic spring of 1987, the average ozone concentration over the South Pole was down 50%. As ozone diminishes in the upper atmosphere, the earth receives more ultraviolet radiation, which promotes skin cancers and cataracts. Crop yields and fish populations may be reduced. Effective government policies and industry practices to limit and ultimately phase out chlorine and bromine emissions which are responsible for O₃ depletion have yet to be formulated. Evidence of O₃ depletion is reviewed, as are the effects of ultraviolet radiation and options for reducing emissions. Provisions of the 1987 Montreal Protocol on substances that deplete the ozone layer are highlighted.

I-44068

Lubin, D., **Ultraviolet radiation environment of the Antarctic Peninsula**, Chicago, University, Dec. 1989, 134p., Ph.D. thesis. 54 refs.

To investigate the effect of the springtime antarctic ozone depletion on the ultraviolet radiation environment of the Antarctic Peninsula, a scanning spectroradiometer was deployed at Palmer Station, Sep. 16-Dec. 21, 1988, to scan the ultraviolet solar spectrum from 290 to 400 nanometers (nm). Weather observations were recorded to describe the role of cloud cover in regulating the UV surface irradiance. At wavelengths shorter than 310 nm the influence of the ozone "hole" is apparent. The 1988 ozone "hole" was a modest event compared to 1987. The smallest ozone abundance measured during the spring of 1988 was 196 Dobson units on Oct. 14. The ozone abundance returned to unperturbed levels above 350 Dobson units in mid-Nov. At wavelengths longer than 310 nm, overcast skies offset the ozone depletion. (Auth. mod.)

I-44069

Brune, W.H., **Potential for ozone depletion in the arctic polar stratosphere**, *Science*, May 31, 1991 252(5010), p.1260-1266, Numerous refs.

The nature of the arctic polar stratosphere is observed to be similar in many respects to that of the antarctic polar stratosphere, where an ozone hole has been identified. Most of the available chlorine (HCl and ClONO₂) was converted by reactions on polar stratospheric clouds to reactive ClO and Cl₂O₂ throughout the arctic polar vortex before midwinter. Reactive nitrogen was converted to HNO₃, and some, with spatial inhomogeneity, fell out of the stratosphere. These chemical changes ensured characteristic ozone losses of 10 to 15% at altitudes inside the polar vortex where polar stratospheric clouds had occurred. These local losses can translate into 5 to 8% losses in the vertical column abundance of ozone. As the amount of stratospheric chlorine inevitably increases by 50% over the next two decades, ozone losses recognizable as an ozone hole may well appear. (Auth.)

I-44121

Lubin, D., Frederick, J.E., **Ultraviolet radiation environment of the Antarctic Peninsula: the roles of ozone and cloud cover**, *Journal of applied meteorology*, Apr. 1991 30(4), p.478-493, 35 refs.

Hourly measurements define the UV radiation environment of the region and, in conjunction with a daily record of sky conditions and radiative transfer modeling, permit a quantitative understanding of the role of cloud cover in regulating UV radiation levels at the antarctic surface, including the period of the springtime ozone depletion. The transmission properties of cloud types over the Antarctic Peninsula are quantified by taking the ratio of UV-A irradiances measured under them to UV-A irradiances calculated for clear skies and

the same solar zenith angle, and the results are then generalized to the UV-B. Under the average overcast sky in the region, UV irradiance at all wavelengths is slightly greater than half of the value for clear skies. Under the thickest overcast layers, UV irradiance at all wavelengths is roughly 20% what it would be if the sky were clear. In a seasonally averaged sense cloudiness has no effect on the percentage enhancement in UV-B surface irradiance that results from the springtime ozone depletion. However, when considering time scales of hours to several days, an increase in cloud cover can be discussed in terms of its ability to attenuate the solar irradiance, in some cases giving a surface UV-B level comparable to that found under an unperturbed ozone column and clear skies. Depending on the amount of ozone depletion and the type of cloud cover, there will always be a wavelength below which surface radiation levels are excessive during spring. (Auth.)

I-44122

Murphey, B.B., Hare, T., Hogan, A.W., Lieser, K., Toman, J., Woodgates, T., **Vernal atmospheric mixing in the Antarctic**, *Journal of applied meteorology*, MP 2874, Apr. 1991 30(4), p.494-507, 54 refs.

Aerosol concentration, ozone concentration, and meteorological parameters were measured at McMurdo and South Pole Stations during a spring storm that reached the antarctic interior. Nacreous clouds were sighted preceding the storm, indicative of stratospheric flow from lower latitudes. These measurements and observations, along with upper-air and surface analyses, indicate that vigorous tropospheric/stratospheric exchange of air occurs near 75S during the spring. The elemental composition of collected aerosol changed coincidentally with different stages of the storm. During the storm event in Sep. 1983, surface ozone concentration varied from 20 to more than 100 ppbv at McMurdo, but remained less than 20 ppbv at the South Pole indicating that deep mixing, which occurred at the periphery of Antarctica during the spring storm, did not continue over the interior of the continent. The warm marine air associated with the spring coastal storm infiltrated the interior of Antarctica including the Polar Plateau, producing a record surface temperature and an aerosol concentration twice the September mean. This system was unusual as the warm front apparently reached the surface of South Pole. Crustal material was transported to the periphery of Antarctica through the upper troposphere or lower stratosphere. Enhanced aerosol concentration was transported to the South Pole through the lower troposphere. Vigorous exchange occurred at latitudes of greater than 78S, which probably exchanged both marine aerosol and water vapor into the lower stratosphere. (Auth.)

I-44136

Gretz, J., **Nexus temperature/atmospheric CO₂ in the past. Paleoclimatic considerations**, *International journal of hydrogen energy*, 1990 15(1), p.197-201, 11 refs.

DLC TP360.I57

The global warming trend caused by CO₂ and other greenhouse gases may have precedents in past climates. The Vostok ice core analysis provides a record of CO₂ variations in the last 160,000 years, and the data suggest that orbital forces may account for the fluctuations observed. An expected ice age in the next 20,000 years may be delayed by 2000 years if greenhouse gases continue to be produced at the same rate.

I-44201

O'Neill, A., ed, NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989, **Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings, North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences**, 1989 Vol.321, 257p., Refs. passim. For selected papers see I-44202 through I-44212 or 45-2972 through 45-2982.

DLC QC881.2.M53N37

This volume is a collection of papers presented at the third workshop held as part of the Middle Atmosphere in the Southern Hemisphere (MASH) project, an international effort to learn more about the ozone depletion mechanism. To emphasize the interdisciplinary nature of the workshop, the volume has not been divided into the separate sections of dynamics, transport and photochemistry in the title. Most of the papers included in these proceedings are pertinent to Antarctica.

I-44202

McIntyre, M.E., **Middle atmospheric dynamics and transport: some current challenges to our understanding, North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences**, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.1-18, Refs. p.15-18.

DLC QC881.2.M53N37

The fluid dynamics of wave propagation, wave breaking, and the resulting turbulence—be it the fully three-dimensional small-scale turbulence due to breaking internal gravity waves, or the layerwise two-dimensional turbulence due to breaking Rossby waves—poses three major challenges to research on middle atmospheric dynamics and chemical transport. These are, first, the unjustifiability of the eddy-diffusivity concept, under conditions often met with in the atmosphere; second, the ill-understood nature of the Rossby-wave-associated dynamical feedbacks on the global circulation and, third, an acute difficulty in parameterizing vertical mixing by convectively overturning gravity waves in the mesosphere and lower thermosphere. The antarctic ozone hole is suggested to provide one of the more conspicuous examples of the first of the three challenges discussed. (Auth. mod.)

I-44203

Karoly, D.J., Graves, D.S., **On data sources and quality for the Southern Hemisphere stratosphere, North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences**, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.19-32, 16 refs.

DLC QC881.2.M53N37

A brief review is presented of current operational analysis systems for the Southern Hemisphere stratosphere, concentrating on the systems used at the National Meteorological Center (USA) and the British Meteorological Office. An assessment is made of two major

sources of error in these current analyses; the tropospheric analyses used at the base-level and the thickness analyses derived from satellite radiance data. Some results on the impact of different base-level analyses on derived stratospheric circulation statistics in the Southern Hemisphere are described. The reliability of analyses obtained from satellite data is assessed by sampling a numerical model simulation of the stratosphere as if by satellite and comparing the sampled statistics with those from the model. Both these areas are shown to lead to problems with the circulation statistics at high latitudes and for differentiated quantities. A possible improved stratospheric analysis system is described, based on modern data assimilation and analysis systems used in the troposphere and using the operational system at the European Centre for Medium Range Weather Forecasts as an example. (Auth.)

I-44204

O'Neill, A., Pope, V.D., **Seasonal evolution of the extra-tropical stratosphere in the Southern and Northern Hemispheres: systematic changes in potential vorticity and the non-conservative effects of radiation, North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences**, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.33-54, 14 refs.

DLC QC881.2.M53N37

Satellite data are used to summarize the main features of the seasonal cycle of the extra-tropical stratosphere in the two hemispheres during one year. Systematic changes in the overall structure of the circulation are identified, and the contribution of the non-conservative effects of radiation to these changes is outlined. (Auth.)

I-44205

Mechoso, C.R., **Final warming of the stratosphere, North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences**, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.55-69, 25 refs.

DLC QC881.2.M53N37

The dramatic changes during spring in the shape of the polar vortex in the stratosphere of the two hemispheres are illustrated, using perspective plots of the three-dimensional structure of the isotach and potential vorticity fields. There are also important interhemispheric differences in the location and magnitude of the largest temperature increases over the polar regions during spring. Those in the Southern Hemisphere are in the lower stratosphere whereas those in the Northern Hemisphere are in the upper stratosphere, the former being almost twice as large as the latter. The values of minimum temperatures in the lower stratosphere suggest that in early spring the conditions suitable for the formation of polar stratospheric clouds, thought to play a key role in ozone destruction, are the rule in the Southern Hemisphere and the exception in the Northern Hemisphere. (Auth. mod.)

I-44206

Newman, P.A., Schoeberl, M.R., Lait, L.R., **Comparison of the Southern Hemisphere springs of 1988 and 1987**, *North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences*, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.71-89, 16 refs.

DLC QC881.2.M53N37

Differences between Southern Hemisphere (SH) springs of 1988 and 1987 in the stratosphere are discussed. The two years present a case study of opposite phases of the equatorial quasi-biennial oscillation (QBO) and the QBO's effect on SH spring stratospheric conditions. During 1988 (easterly QBO phase), mid-latitude temperatures were warmer than 1987 (westerly QBO phase) during July and Aug., while polar temperatures were similar. During Sep., Oct., and Nov., 1988 polar temperatures were substantially higher than in 1987. Total ozone values reflected these thermal differences, with record low ozone values in Oct. 1987 following the Sep. ozone hole depletion phase, and higher total ozone values in Oct. 1988. The large temperature differences result from a larger warming rate in 1988 than in 1987. Similarly, the higher total ozone amounts in Oct. 1988 resulted from a weaker depletion during Sep. 1988. The faster warming rate of temperature, and slower depletion rate for ozone in 1988, do not occur in a smooth linear fashion, but occur as a series of events which result from strong planetary wave one events. (Auth.)

I-44207

Hirota, I., **Traveling planetary waves in the middle atmosphere**, *North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences*, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.111-116, 9 refs.

DLC QC881.2.M53N37

Recent progress in the study of free traveling planetary waves in the middle atmosphere is briefly reviewed, by paying special attention to interhemispheric differences in connection with the seasonal variation of mean flows. Observational evidence is presented for various westward traveling modes (normal mode Rossby waves), and for the eastward traveling waves in the Southern Hemisphere, a process which is related to the intense sudden warming over Antarctica during mid-winter. (Auth. mod.)

I-44208

Hartmann, D.L., **Dynamical properties of the antarctic circumpolar vortex inferred from aircraft observations**, *North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences*, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.117-134, 31 refs.

DLC QC881.2.M53N37

The amount of dynamical mixing and transport during winter and spring plays a key role in the seasonal evolution of total ozone in the

middle atmosphere of the Southern Hemisphere. Too much mixing and heat transport will shut off the ozone-destroying chemistry. A small amount of transport can actually enhance the amount of ozone destroyed photochemically in the lower stratosphere. Aircraft observations taken during the Airborne Antarctic Ozone Experiment in Aug. and Sep. 1987 allow the estimation of the amount of mixing and transport of ozone during the time that the ozone hole developed in that year. Estimates based on conservative tracer data indicate that ozone was transported into the region where the ozone hole developed, thus requiring a photochemical sink for ozone that is at least as large as the observed rate of decline of ozone. By assuming a mean radiative cooling of 0.2 K/day, it is estimated that the net transport of ozone was relatively small, only 20% + /- 10% of the observed trend and of the opposite sign. (Auth. mod.)

I-44209

Kanzawa, H., Kawaguchi, S., **Large stratospheric sudden warming in antarctic late winter and shallow ozone hole in 1988: observation by Japanese Antarctic Research Expedition**, *North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences*, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.135-148, Refs. p.146-148.

DLC QC881.2.M53N37

There occurred a large stratospheric sudden warming in the Southern Hemisphere in late winter of 1988 which competes in suddenness and size with major mid-winter warmings in the Northern Hemisphere. Associated with the dynamical phenomenon of the sudden warming, total ozone increased over the eastern hemispheric part of Antarctica. The sudden warming as well as other warmings which followed it made the 1988 ozone hole shallow in depth and small in area. Long-term observation at Showa Station depict well the characteristics of the 1988 event. (Auth.)

I-44210

Solomon, S., **Nitrogen chemistry in Antarctica: a brief review**, *North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences*, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.191-201, Refs. p.198-199.

DLC QC881.2.M53N37

Measurements of reactive nitrogen species in Antarctica are briefly reviewed and their links to ozone depletion are summarized. Observations of NO, NO₂, HNO₃, particulate nitrate, and total NO_y demonstrate that the composition of the antarctic stratosphere is greatly perturbed by the presence of clouds. Further, measurements have shown that the clouds themselves are composed in part of HNO₃, and that sedimentation of cloud particles apparently can remove reactive nitrogen from the gas phase altogether. These processes reduce the abundance of stratospheric NO₂, a primary requirement for elevated ClO densities and attendant ozone loss. (Auth.)

I-44211

Crutzen, P.J., Brühl, C., **Potential role of HO_x and ClO_x interactions in the ozone hole photochemistry**, *North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences*, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.203-212, 7 refs.

DLC QC881.2.M53N37

It is demonstrated by model calculations that odd hydrogen can play a significant role in ozone destruction in the polar lower stratosphere whenever nitric acid vapor volume mixing ratios are below about 1 ppbv. The production of odd hydrogen after sunrise is significantly enhanced by a newly discovered reaction involving ClO and the methyl peroxy radical. Decrease of overhead ozone in the Southern Hemisphere leads to an increase in OH and hydrogen peroxy radical concentrations and a reduction in tropospheric ozone because of increasing penetration of UV radiation. (Auth.)

I-44212

Grose, W.L., Eckman, R.S., Turner, R.E., Blackshear, W.T., **Antarctic ozone depletion and potential effects on the global ozone budget**, *North Atlantic Treaty Organization. ASI Series C: Mathematical and Physical Sciences*, 1989 Vol.321, Dynamics, transport and photochemistry in the middle atmosphere of the Southern Hemisphere. Proceedings of the NATO Advanced Research Workshop on Dynamics, Transport and Photochemistry in the Middle Atmosphere of the Southern Hemisphere, San Francisco, CA, U.S.A., Apr. 15-17, 1989. Edited by A. O'Neill, p.237-251, Refs. p.249-251.

DLC QC881.2.M53N37

In addition to the dramatic reductions in polar ozone observed in the springtime antarctic stratosphere during the past decade, data from the Total Ozone Mapping Spectrometer (TOMS) instrument also provide evidence of a reduction in total columnar ozone extending into middle latitudes of the Southern Hemisphere. It has been suggested that dilution of the mid-latitude air by export of ozone-poor air from polar regions following breakup of the vortex would create a deficit which might persist for a long period because of the slow chemical replacement time (months to a year in the lower stratosphere) for ozone. If the deficit is maintained until the next springtime depletion episode, the effect might be cumulative, with a permanent reduction in the global ozone budget and, hence, a possible explanation for the mid-latitude reductions of ozone seen in the TOMS data. A study of the so-called "dilution effect" has been conducted using a three-dimensional chemistry/transport model. The results of the model simulations reveal a small but significant residual deficit in the total ozone in the Southern Hemisphere 1 year following the formation of an ozone hole in the polar regions.

I-44213

Flohn, H., **Climate evolution in the Southern Hemisphere and the equatorial region during the Late Cenozoic**, *Late Cenozoic paleoclimates of the Southern Hemisphere*. Edited by J.C. Vogel, Rotterdam, A.A. Balkema, 1984, p.5-20, Refs. p.18-20.

DLC QC884.L38

Since the atmosphere above the Antarctic is much colder than that above the Arctic (due to the different heat budgets), the Southern Hemisphere (SH) tropospheric circulation is stronger and expands across the equator. In contrast with the weaker standing eddies in SH mid-latitudes, large longitudinal deviations exist in the equatorial region (Southern Oscillation). The role of coastal and equatorial up-

welling (concentrated between 0-10S) in the control of the CO₂ and H₂O balance is outlined. This air-sea exchange of greenhouse gases may be responsible for abrupt climatic changes on a 100 year time scale. After a short review of major climatic events since the Eocene/Oligocene transition, the unipolar glaciation of the Antarctic during the Late Miocene and Early Pliocene is described together with the strongly asymmetric climatic pattern prevailing during this period. (Auth. mod.)

I-44214

Pickard, J., Selkirk, P.M., Selkirk, D.R., **Holocene climates of the Vestfold Hills, Antarctica, and Macquarie Island**, *Late Cenozoic paleoclimates of the Southern Hemisphere*. Edited by J.C. Vogel, Rotterdam, A.A. Balkema, 1984, p.173-182, Refs. p.181-182.

DLC QC884.L38

The Vestfold Hills are a 400 sq km ice-free oasis on the coast of East Antarctica. Mean daily temperatures are >0 C for <2 months annually. The terminal Pleistocene ice sheet advance (Vestfold Glaciation) covered the hills. The fossil and geomorphic evidence shows no substantial climatic change in the Holocene. Subantarctic Macquarie I. supports fjeldmark, herbfield and grassland vegetation with c. 40 vascular and c. 110 bryophyte species. Its hyperoceanic climate has a mean annual temperature of 4.5 C and rainfall of 926 mm. The Antarctic Convergence lies south of the island but during the Last Glacial Maximum lay north of it. Palynological studies of peat from three sites show that plant remains had begun accumulating by 9500 BP, and suggest that there was no major climatic fluctuation during the Holocene on Macquarie I. The apparent lack of major climatic change during the Holocene in both the Vestfold Hills and on Macquarie I. is similar to interpretations from elsewhere in Antarctica, Marion I. and South Georgia. Possible reasons for the apparently constant climate are that it was only relatively constant, or that the ecological amplitudes of the fossil species are so wide that minor climatic changes are not reflected. (Auth. mod.)

I-44223

Asahi, M., Makino, Y., Sasaki, T., Tsutsumi, Y., **Relationships between total amounts of ozone and upper air data at Syowa in Antarctica**, *Papers in meteorology and geophysics*, Apr. 1990 41(1), p.1-13, 8 refs.

In order to study the behavior of atmospheric ozone in Antarctica, the correlation coefficients between total amounts of ozone and altitudes, and between those and upper-air temperature at Showa Station, for each month of spring and summer, have been computed during the period 1982 to 1987. It is statistically shown that the characteristics of these monthly correlation coefficients are found for the months of Oct. and Dec., and they are divided into three seasonal patterns. Two of the three patterns have characteristics at Showa, while one is also seen in Japan. (Auth.)

I-44225

Boer, G.J., **Vorticity budget of the hemispheres**, *Journal of the atmospheric sciences*, Jan. 1, 1991 48(1), p.19-39, 13 refs.

The output of the Canadian Climate Center's GCM is presently used in conjunction with objective analyses for the FGGE period to investigate the cyclonic vorticity budget of the hemispheres. Direct estimates of the topographic sources/sink term show a strong vorticity source which is associated with drainage flow from the elevated cold antarctic plateau in southern winter, and the reverse, a strong vorticity source associated with upward motion over the elevated, warm Tibetan plateau, in northern summer. Direct estimates of the frictional source/sink term exhibit highest values over oceans in winter, and over portions of the warm northern continental land masses in summer. A duality emerges in the Southern Hemisphere vorticity, where there is an almost complete cancellation between the vorticity fluxes

associated with the meridional circulation's upper branches and that associated with the transient eddies. (Auth. mod.)

I-44228

McMaster, L.R., Powell, K.A., **SAM II measurements of the polar stratospheric aerosol. Vol.9: Oct. 1982-Apr. 1983, U.S. National Aeronautics and Space Administration. Reference publication**, Feb. 1991 NASA-RP-1244, 72p., N91-18505, 22 refs.

The Stratospheric Aerosol Measurement (SAM) II sensor aboard Nimbus 7 is providing 1.0 micron extinction measurements of antarctic and arctic stratospheric aerosols with a vertical resolution of 1 km. Representative examples and weekly averages including corresponding temperature profiles provided by NOAA for the time and place of each SAM II measurement are presented. Contours of aerosol extinction as a function of altitude and longitude or time are plotted and aerosol optical depths are calculated for each week. Typical values of aerosol extinction and stratospheric optical depth in the Antarctic varied considerably in the Spring of 1982 due to the transport and arrival of the material from the El Chichon eruption. The stratospheric optical depth varied from 0.002 in Oct. 1982, to 0.021 in Jan. 1983. (Auth. mod.)

I-44265

Lal, B., **Energy in wind over Dakshin Gangotri and Novolazarevskaya in Antarctica, Mausam**, July 1990 41(3), p.503-504, 4 refs.

In this brief note, the author computes and compares wind energy over two antarctic stations, the permanent station Dakshin Gangotri and a temporary station Maitree located near the permanent station Novo, by reference to previously accumulated meteorological data obtained over a 13 year period (1961-73). The objective is the production of a data base to assist in assessing the feasibility of the mechanical exploitation of wind power as an antarctic energy source. Monthly wind energy variations are given, and comparisons between the wind dynamics over the two stations are discussed.

I-44267

Kawaguchi, S., ed, NIPR Symposium on Polar Meteorology and Glaciology, 12th, Tokyo, July 18-19, 1989, **Proceedings of the NIPR Symposium on Polar Meteorology and Glaciology, No.4**, Tokyo, National Institute of Polar Research, 1991, 143p., Refs. passim. For individual papers see E-44278, F-44273, F-44275, F-44276, G-44277, I-44268 through I-44272 and J-44274 or 45-3061 through 45-3068.

This is a collection of papers presented at the 12th Symposium on Polar Meteorology and Glaciology held on July 18-19, 1989, in Tokyo. It consists of 12 full length papers and 29 abstracts; the former are arranged in areas of meteorology, glaciology, and physical oceanography. They include studies of atmospheric constituents and aerosols, ozone, atmospheric circulation and instrumentation, snow cover, sea ice, ice sheet, and ice core studies as part of the research programs of the Antarctic Climate Research, 1987-1991, East Queen Maud Land Glaciological Project, 1982-1986, and Middle Atmosphere Program, 1982-1985.

I-44268

Matsubara, K., **Results of ozone observation from the equatorial region to Antarctica in 1987**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.1-11, 14 refs.

Total ozone and vertical ozone profile were measured by Brewer ozone spectrophotometer and ozonesondes, respectively. The de-

tailed latitudinal distribution of total ozone and height-latitude distributions of ozone concentration, temperature and wind, at 5-deg latitude intervals from the equator to Antarctica, were observed. From ozonesonde observations, the injection of ozone from the stratosphere to the troposphere through the tropopause gap was deduced. The decreased ozone concentration in the lower stratosphere, similar to the antarctic ozone hole, was observed south of 60S. It is suggested that this phenomenon was caused by transport of ozone-poor air (a dilution effect) following the spring time ozone hole. (Auth. mod.)

I-44269

Iwasaka, Y., Hayashi, M., **Nitric acid transport from the stratosphere to the troposphere and ice sheet in Antarctica through polar stratosphere**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.12-21, 17 refs.

Growth and sedimentation of polar stratospheric clouds (PSCs) particles are examined using the Test Particle Sedimentation Model. PSCs particles transport stratospheric nitric acid (HNO₃) to the troposphere. The amounts of HNO₃ and H₂O removed by a particle depends on the trajectory of the particle (length of path and residence time). Usually the removed amount is larger in the upper portion of the PSCs layer than in the lower portion. The features of HNO₃ transport are consistent with the results of chemical analyses of the antarctic ice sheet and of aerosols sampled at the surface of the ice sheet. (Auth.)

I-44270

Yamanouchi, T., Kanzawa, H., Ariyoshi, H., Ejiri, M., **Report on the first MOS-1 data received at Syowa Station, Antarctica**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.22-30, 6 refs.

Data from Marine Observation Satellite 1 (MOS-1) have been received since Feb. 1989 at Showa Station, by the newly installed Multi Purpose Satellite Data Receiving System (11 m antenna). The data of more than 200 paths are to be received per year to study polar atmosphere, ice sheet and sea ice, using three sensors, MESSR, VTIR and MSR. Two HDDTs were brought back to Japan; they are composed of 13 paths acquired at the beginning of the system operation. Quick look films of these data were made, and some typical scenes of MESSR, VTIR and MSR were processed at NASDA EOC. Interesting features, such as a giant iceberg, are found among these processed images. Some limits of practical use of MESSR, depending on the gain and solar elevation angle, are discussed. (Auth.)

I-44271

Seko, K., Wada, M., Aoki, S., **Characteristic variation of Tb in the antarctic region revealed by NOAA AVHRR channel-4 data**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.31-42, 15 refs.

Based on the daily variation of brightness temperature (Tb) of NOAA AVHRR channel-4 data, several characteristic features of Tb variations in the antarctic region are presented. Remarkable differences in the Tb variation between ocean and continent were found: the amplitude of the seasonal cycle of the variation is much larger over the continent, because of the strong inversion over it in winter. The short term Tb variation within 10 days over the ocean is controlled by synoptic disturbances. The Tb variation over the continent reveals longer periodicity. The variation is caused by the cloud intrusion into the antarctic continent. (Auth. mod.)

I-44272

Nishikawa, M., **Distribution of elemental and organic carbon aerosols in the atmosphere between Japan and Antarctica**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.52-57, 10 refs.

From Nov. to Dec., 1988, aerosol samples were collected on board the research vessel *Shirase* between Japan and Antarctica. Carbon contents of the samples were determined using gas chromatography after separating elemental and organic carbon by the conventional pyrolysis method. The concentration levels of elemental and organic carbon aerosols were found to be on the order of 100 ng/cu m over the antarctic ocean. These values were lower by two orders of magnitude than those in Tokyo Bay and higher by one order of magnitude than those at Showa Station. (Auth.)

I-44279

Lutsenko, E.I., **Use of satellite information on cloudiness in analysis and weather forecasting in the Antarctic** [Ispol'zovanie sputnikovoï informatsii ob oblachnosti v analize i prognoze pogody v Antarktike], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.5-9, In Russian. 9 refs.

The importance of the role satellite information on cloudiness plays in operational analysis and short term weather forecasting is stressed. Automatic ground receivers operating at 5 Soviet antarctic stations, and the reliability of meteorological data they provide, are discussed.

I-44280

Lutsenko, E.I., Fedosov, M.K., **Formation of climatic cyclones in the antarctic atmosphere** [O formirovanii klimaticheskikh tsiklonov v atmosfere Antarktiki], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.9-13, In Russian. 5 refs.

The structure of the antarctic pressure field principally related to the formation of climatic cyclones is studied on mean-monthly charts of pressure distribution in the Southern Hemisphere, at sea level, for the period of 1970 to 1984. The reasons for the formation of the cyclones, and the factors defining their geographic location and intensity, are discussed. The presence in the antarctic atmosphere is noted of three principal and two secondary climatic cyclones, centered at about 65S and 25E over the Atlantic Ocean. The probability of cyclone formation in the mean-monthly pressure field fluctuates between 80% in summer and 95% during the colder period.

I-44285

Leont'ev, E.B., **Operations at Bellingshausen Station in 1986 of the regional center for hydrometeorological information distribution to ships** [Ob opyte raboty regional'nogo tsentra na stantsii Bellinsgauzen po gidrometeorologicheskemu obespecheniiu navigatsii v 1986 g.], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.32-36, In Russian.

The geographic location of Bellingshausen Station allows the hydrometeorological center it houses to observe in detail the synoptic processes and the distribution of drifting ice in the region of the South Orkney Is., South Georgia, Falkland Is., and the seas north and west of the Antarctic Peninsula. Thus, in cooperation with other stations in the area, the Bellingshausen Station center is part of an international system providing information to expeditionary ships which is vital for safe navigation in the area. Operational details of gathering and distributing the information are described. In weather forecasting, the criteria used for defining dangerous weather conditions are out-

lined. Based on the center's activities in 1986, certain recommendations for improving the efficiency of the international effort are made.

I-44290

Safronov, V.A., Volodin, V.I., Zharnovetskii, F.V., **Satellite communication for transmission of hydrometeorological information in the Antarctic** [Ispol'zovanie sredstv sputnikovoï svyazi dlia peredachi gidrometeorologicheskoi informatsii v Antarktike], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.55-62, In Russian.

The need for efficient transmission of hydrometeorological data to ships in antarctic waters from stations receiving satellite information is discussed. A qualitative evaluation of radio channels and the quantitative estimate (%) of delays between Molodezhnaya Station and Moscow, and Molodezhnaya and other Soviet antarctic stations, are presented in tables. Experimental results confirm that satellite systems can be used at all stations.

I-44292

Evseev, M.P., Kolosova, N.V., Golev, D.A., **Status and improvement prospects of meteorological information services for navigation in the southern ocean** [O sostoianii i perspektivakh usovershenstvovaniia meteorologicheskogo obsluzhivaniia moreplavaniia v IUzhnom okeane], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.70-78, In Russian.

Based on research during the *Professor Vize* cruises in 1986-1988, some considerations regarding the quality of operational meteorological information in the southern ocean are presented. From data obtained from radar satellite images, and maps compiled at various meteorological stations, the coordinates are given determining the centers of cyclonic activity in the Pacific sector and in the Atlantic-Pacific sector of the Antarctic. Comparison of analysis results of surface pressure field and radar satellite images from Dec. 1986 to Feb. 1987 is shown in tables. Ground level pressure field zones for Feb. 14 and 15, 1988, are mapped.

I-44293

Romanov, A.A., Safronov, V.A., Mikhin, N.D., **Communication system requirements for scientific and operational navigation services in the Antarctic** [Trebovaniia k sisteme svyazi dlia nauchno-operativnogo obespecheniia sudokhodstva i provedeniia nauchnykh issledovaniï v Antarktike], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.78-81, In Russian. 3 refs.

Satellite communication networks between Soviet antarctic stations and ships in the Antarctic are discussed. The increased demand for accuracy in the meteorological information transmitted confirms the need that such data be perfected by the additional use of satellite information. The advantages of such interaction, and the process of data reception and transmission, are described. The primary interacting units of a scientific operational facility system in the Antarctic are reviewed.

I-44296

By radio from Antarctica [Po radio iz Antarktiki], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionyi biulleten'*, 1990 No.114, p.93-94, In Russian.

A month-to-month table is presented on meteorological data, including atmospheric pressure and temperature, wind speed, relative humidity, cloudiness and mean height reached by radiosondes, recorded at each of the 7 Soviet stations from Jan. through June, 1989.

I-44297

Fraedrich, K., Leslie, L., **Predictability studies of the antarctic atmosphere**, *Australian meteorological magazine*, Mar. 1991 39(1), p.1-9, 25 refs.

In this study estimates are made of the predictability time-scales for the Weddell Sea section of the antarctic region. Two distinct methods were applied. One of the methods used was a traditional approach due to Lorenz in which the rate of separation of initially close atmospheric states (analogues) was calculated. It was found here that even the best 500 h Pa height field analogues were only mediocre and that root mean square differences between the analogues grew very rapidly, suggesting that the predictability time-scales might be quite short. The absence of very good analogues shows that an analogue approach is probably not suitable for the Weddell Sea region, and the predictability estimates obtained should be treated with caution. An alternative approach, in which recently developed chaos theory, also known as non-linear systems analysis, was applied to the Australian Bureau of Meteorology archived analyses of 500 hPa cyclone track positions, was also investigated. The results suggest the existence of a low-dimensional attractor, describing the dynamics of the weather systems, of fractal dimension somewhere between 5 and 6. Rates of separation calculated from this algorithm also gave short predictability time-scale estimates of about one day for the error doubling time. (Auth. mod.)

I-44314

Datta, R.K., **Temperature anomaly over Antarctic and monsoon activity**, *Mausam*, Jan. 1989 40(1), p.95-100, With Hindi summary. 16 refs.

Antarctica covers a significant portion of the Southern Hemisphere where surface temperature can be as low as -70 C, compared to the surface temperature of 28 C over the equatorial region. In this study a possible linkage between anomalies of surface temperature over Antarctica and monsoon dynamics has been examined. It is observed that the Jan. surface temperature anomaly pattern over Antarctica has an association with the intensity of the subsequent monsoon. Drought years are preceded by predominantly warm anomalies over Antarctica and normal monsoon years are preceded by equally marked cold anomalies. (Auth. mod.)

I-44331

Mittner, P., Bonasoni, P., Evangelisti, F., Cini, R., **Aerosol sampling: a one-stage inertial impactor and its use in the 1989-90 campaign**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.107-109, 3 refs.

A high volume, one stage inertial impactor has been built for separate collection of the fine (submicrometric) and coarse components of the aerosol. The impactor has been successfully run at twelve hour sampling intervals during the 1989-90 Italian expedition in Antarctica. A multielemental analysis of the samples (collected on membranes) is planned. (Auth.)

I-44332

Maione, M., Crescentini, G., Mangani, F., Bruner, F., **In situ measurements of the tropospheric concentration of chlorofluorocarbons in Antarctica**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.111-117, 11 refs.

A project to establish a permanent station for the monitoring of ground-level chlorofluorocarbons (CFCs) concentrations at Terra Nova Bay was started during the 1989-90 Italian expedition. Measurements were carried out by gas-chromatography with electron capture detection (GC-ECD); permeation tubes were used for calibration. Air was sampled through a 25 or 50 ml loop, transferred onto a suitable adsorbent and injected into the gas chromatograph by the heat-stripping technique. Data obtained in Feb. 1990 are reported. (Auth.)

I-44333

Corazza, E., **Carbon oxides, methane and hydrogen in antarctic atmosphere (Terra Nova Station)**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.119-125, 10 refs.

Gas-chromatographic *in situ* measurements of atmospheric trace components (CO₂, H₂, CO, CH₄) were made at Terra Nova Bay Station continuously during one month (Jan.-Feb. 1990). H₂ and CO₂ concentrations are similar to those found in other parts of the world, while lower concentrations were found for CH₄ (450 ppbv) and for CO (57 ppbv). The latter especially is regarded as representing a background level for the atmosphere itself, comparable to high-latitude, open-sea results. CO₂ concentration, at 360 ppmv, is the consequence of a high residence time and a well-mixed atmosphere. (Auth.)

I-44337

Michetti, I., Perini, A., Testa, L., **Environmental impact of the Italian antarctic station at Terra Nova Bay**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.149-154.

Investigations on the human factor impact of the Terra Nova Bay Station on its environment have been carried out from 1986 to the present. Airborne particulate matter was sampled and analyzed; the water treatment plant and incinerator monitoring was planned and performed at the Station. A review is presented of the four-year activity; a noticeable increment of the elements V, Fe, Al and Mn occurred over this time.

I-44351

Lee, B.Y., Nam, J.C., **Monthly meteorological data at King Sejong Station (June-Dec. 1990)**, *Korean journal of polar research*, Dec. 1990 1(2), p.75.

Results of the June-Dec., 1990 monthly meteorological observations at King Sejong Station are presented in a table. Data include atmospheric pressure and temperature mean, maximum and minimum values; mean and maximum speed and predominant direction of wind; mean and minimum relative humidity values; cloudiness; mean dew-point temperature; total precipitation; snowfall total and maximum depth values; and number of blizzard-, rain-, snow-, and fog-days.

I-44352

Toon, O.B., Turco, R.P., **Polar stratospheric clouds and ozone depletion**, *Scientific American*, June 1991 264(6), p.68-74, 3 refs.

During the antarctic winter, strange and often invisible clouds form in the stratosphere over the pole. These clouds of ice and frozen nitric acid play a crucial role in the chemical cycle responsible for the recent appearance of the annual "ozone hole." Their chemistry

removes compounds that would normally trap ozone-destroying free chlorine produced by the breakdown of CFCs. This paper describes the discovery, formation, composition and atmospheric effects of such clouds, and elaborates on their influential contribution to mechanisms of atmospheric ozone depletion over Antarctica. (Auth. mod.)

I-44406

Ghil, M., Mo, K., **Intraseasonal oscillations in the global atmosphere. Part 2: Southern Hemisphere**, *Journal of the atmospheric sciences*, Mar. 1, 1991 48(5), p.780-790, 31 refs.

In this article, the results of the systematic examination of oscillatory modes in the global atmosphere, derived by studying 12 years of 500 mb geopotential heights in the Southern Hemisphere, are presented. The data were band-pass filtered to focus on intraseasonal phenomena, and spatial empirical orthogonal functions (EOFs) were obtained. The leading principal components were subjected to singular spectrum analysis, in order to identify nonlinear intraseasonal (IS) oscillations with high statistical confidence. In the Southern Hemisphere, the dominant mode has a period of 23 days, with spatial patterns carried by the second and third winter EOF of the IS band. It has a zonal wavenumber-four structure. The 40-day mode is second, and dominated by wavenumbers three and four, while a 16-day mode is too weak to distinguish its spatial behavior from the previous two. The IS dynamics in the Southern Hemisphere is more complex and dominated by shorter wavenumbers than in the Northern Hemisphere. No statistically significant correlations between the Southern Hemisphere and the tropics or the Northern Hemisphere are apparent in the IS band. (Auth. mod.)

I-44407

Wada, M., **Estimation of vertically integrated liquid water contents in the atmosphere**, *Antarctic record*, Mar. 1991 35(1), p.1-11, 12 refs.

Estimates of vertically integrated liquid water content of clouds, based on data obtained with microwave radiometers, are discussed. Methods to obtain reliable values, and some drawbacks in the use of radiometers in cold regions, are described. Two pertinent studies carried out at Showa Station July 24-28 and Oct. 23-25, 1988, and the resulting charts, are examined.

I-44416

Crowley, T.J., Baum, S.K., Hyde, W.T., **Climate model comparison of Gondwanan and Laurentide glaciations**, *Journal of geophysical research*, May 20, 1991 96(D5), p.9217-9226, Refs. p.9225-9226.

Geologic studies indicate that the Carboniferous glaciation on Gondwanaland was approximately as extensive as the ice sheets during the Pleistocene. However, there is one major difference between the climate boundary conditions for the two ice sheets: the Gondwanan ice sheet was located on a supercontinent. Three different levels of sensitivity experiments were conducted to examine the effect of the large landmass on the magnitude of summer warming over the ice sheets. Results suggest that conditions necessary to explain Gondwanan ice sheet stability may be known, but required boundary conditions would be more extreme than in the Pleistocene. Although a number of uncertainties remain in these calculations, they help to better define critical conditions for glaciation for one of the most prolonged periods of continuous glaciation in Earth history. (Auth. mod.)

I-44433

Harvey, M.J., **Summertime aerosol measurements in the Ross Sea region of Antarctica**, *Atmospheric environment*, 1991 25A(3/4), p.569-580, 25 refs.

The physical and chemical characteristics of atmospheric aerosol were determined at a site remote from anthropogenic influences, on

the edge of the antarctic continent. The number concentration (0.12-3.12 microns diameter) ranged between 9 and 90/cu cm and the corresponding mass between 0.1 and 3.7 micrograms/cu m. The concentration of sulphate in two filter samples was 0.29 and 0.48 micrograms/cu m. Size distribution at the site were remarkably invariant. The two major factors affecting the size distribution and concentration were occurrence of precipitation and atmospheric stability, respectively. Modes in the volume distribution occurred at about 0.2 and 2.0 microns diameter. The smallest particles <0.1 micron diameter were composed entirely of sulphur species, whereas particles above about 0.5 micron diameter consisted mainly of sea-salt minerals. Similarities in size distribution and composition were observed between aerosols <0.5 micron diameter collected in this study and those sampled in the free troposphere of the Southwest Pacific. (Auth.)

I-44455

Li, H.Z., Li, X.D., **Study on the microclimate in a mossy area of King George Island, Antarctica**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.127-134, 3 refs.

By using the micrometeorological observation data in a mossy area and the daily meteorological data of Great Wall Station (GWS), the authors found two microclimate features in this study: the amplitude of diurnal variation of temperature in the lower layer above the ground in the mossy area is decreasing rapidly with altitude under any kind of weather conditions; and the difference between the diurnal mean surface (0 cm height) temperature and mean surface air (150 cm height) temperature in the mossy area is much smaller than at GWS. It is suggested that the difference between the moss cushion in the microclimatic observation field and the bare sandy soil in GWS may have an important influence on the microclimate features of those areas. (Auth.)

I-44460

Ohtani, S., Kanda, H., Ino, Y., **Microclimate studies in the Yukidori Valley, Langhovde, Antarctica in 1988-1989 (extended abstract)**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.186-188, 2 refs.

Microclimate data measured by the members of JARE-29 in the Yukidori Valley, from Jan. to Apr. 1988, and from Nov. 1988 to Jan. 1989, were analyzed. The stations for the microclimate study are shown. Three microclimate stations (MCS-1 to MSC-3) were set up along the valley from the upper to lower courses. The altitudes of MCS-1, 2 and 3 are 180 m, 60 m and 10 m, respectively. The microclimate data at these stations were automatically recorded with a data logger at intervals of 15 minutes (occasionally 30 minutes). These data were already published in the series of JARE Data Reports (Ohtani et al., 1990) with the detailed methods and specifications of instruments for measurement. The preliminary results of the analysis of the relationships between the microclimate data and topographic condition of the studied stations are given. (Auth. mod.)

I-44463

Tucker, G.B., **Confidence in modelling future climate: a Southern Hemisphere perspective**, *Climatic change*, Apr. 1991 18(2-3), p.195-204, Refs. p.203-204.

Climate models are essentially surrogates for the real system, in which experiments can be carried out. When these experiments attempt to simulate future climate, the results cannot be compared with the real atmosphere because they involve changes unique in recorded human history. Confidence indicators include model comparison with the real atmosphere for current climate representation, and model intercomparison for future climate representation. From a Southern Hemisphere perspective general circulation models (GCMs)

reveal some inadequacies in their representation of climate and differ significantly from each other in their response to a CO₂ doubling. Representation of drought as a response to sea surface temperature anomaly is shown to be successful but strongly dependent on correct parameterization of land surface exchange processes. More attention to Southern Hemisphere representation is required, particularly because of the likely strong role of the oceans. (Auth.)

I-44469

Grimmett, M.R., Currie, K., **Chemistry of air pollution: an overview**, *New Zealand journal of geography*, Apr. 1991 No.91, p.5-12, 10 refs.

The review includes the historical aspects of pollution, the measuring of pollution levels, and the description of major air pollutants and their nature. In the section discussing the CFCs and ozone depletion, it is suggested that the antarctic ozone hole, as we know it, will not recover until chlorine levels fall back below 2 ppb. The point is stressed that the use of CFCs should be reduced worldwide.

I-44471

Simmons, A.J., Chen, J., **Calculation of geopotential and the pressure gradient in the ECMWF atmospheric model: influence on the simulation of the polar atmosphere and on temperature analyses**, *Royal Meteorological Society. Quarterly journal A*, Jan. 1991 117(497), p.29-58, 35 refs.

In this paper, the spectral atmospheric model used for prediction at the European Centre for Medium Range Weather Forecasts (ECMWF) is modified to change the spectrally-represented thermodynamic variable from temperature to the deviation of temperature from a reference profile which depends analytically on pressure. The revised scheme significantly improves southern hemispheric forecasts, with differences originating over Antarctica, and with a small improvement over the Arctic. The improvement seen at high latitudes is also captured by a simpler revision which retains temperature as the spectrally-represented variable, and uses a reference temperature only in the computation of the pressure-gradient terms in gridpoint space. Results indicate that much of the systematic difference in behavior between simulations at high latitudes can be removed by changing the pressure-gradient calculation. In particular, the new schemes correct a systematic tendency for erroneously high pressures east of the Ross Ice Shelf over Antarctica in lower resolution simulations at medium and longer time ranges. The reference temperature profile has also been used in data assimilation to reduce a systematic error in the calculation of first-guess geopotential heights at standard pressure levels. The resulting height analyses agree slightly better with radiosonde measurements, and initialization causes less of a degradation of the fit with observed data. Temperatures are systematically warmer in the upper troposphere and cooler in the lower troposphere, and are closer to observed values. Results from forecasts carried out after one and two days of assimilation show small improvements in the short and early medium range, but are inconclusive at longer time ranges. (Auth. mod.)

I-44472

Hou, A.Y., Schneider, H.R., Ko, M.K.W., **Dynamical explanation for the asymmetry in zonally averaged column abundances of ozone between northern and southern springs**, *Journal of the atmospheric sciences*, Feb. 15, 1991 48(4), p.547-556, 34 refs.

The observed zonally averaged column ozone shows a maximum at 90N during the northern winter and spring and at 60S throughout the southern winter and spring. This asymmetry is explained in the context of a zonally averaged model with coupled radiation, dynamics, and chemistry, together with consistently parameterized planetary wave driving and wave transport. It is shown that in the presence of weak wave driving, the penetration of the tropospheric circulation into the lower stratosphere and the characteristics of ozone chemistry

are such that they produce a column ozone maximum at subpolar latitudes. The effect of increased wave driving is to intensify the residual circulation and extend it farther poleward, resulting in an ozone maximum at the pole. The role of the mesospheric drag is to further enhance these column ozone maxima. Model calculations show that the positions of the observed column ozone maxima are consistent with intensities of wave driving in the two hemispheres derived from data. (Auth.)

I-44473

Pettré, P., André, J.C., **Surface-pressure change through Loewe's phenomena and katabatic flow jumps: study of two cases in Adélie Land, Antarctica**, *Journal of the atmospheric sciences*, Feb. 15, 1991 48(4), p.557-571, 22 refs.

Several Loewe's phenomena, where a sudden transition from shooting to tranquil flow takes place, have been observed. Two of them have been well documented and are shown here. For both cases, as observed at a downstream station close to the coast, the mean wind speed suddenly decreased from about 20 m/s to almost zero, while a large pressure increase was recorded: 5.7 hPa on Dec. 3, 1985 and 2.1 hPa on Dec. 18, 1985. This paper aims at explaining such large surface-pressure changes. In both cases, the flow is stratified upwards with a surface well-mixed cold air layer, a very stable capping inversion layer, an overlying unstable layer thickening from upstream to downstream, and a stable transition layer to the free atmosphere. A new approach is proposed, based on the application of the Bousinesq form of Bernoulli's theorem. This study supports the idea that the pressure change through Loewe's phenomena is mainly connected with the strong acceleration of the downslope katabatic layer under the effect of gravity, rather than with the change in depth of the cold air layer. This new approach fully explains the observed data and the surface-pressure change through the jump. (Auth. mod.)

I-44474

Stephenson, J.A.E., Scourfield, M.W.J., **Importance of energetic solar protons in ozone depletion**, *Nature*, July 11, 1991 352(6331), p.137-139, 9 refs.

Chlorine-catalyzed depletion of the stratospheric ozone layer has commanded considerable attention since 1985, when a decrease of 50% in the total column ozone was observed over Antarctica in the austral spring. Examined here is the depletion of stratospheric ozone caused by the reaction of ozone with nitric oxide generated by energetic solar protons, associated with solar flares. During large solar flares in Mar. 1989, satellite observations indicated that total column ozone was depleted by about 9% over about 20% of the total area between the South Pole and latitude 70S. Chlorine-catalyzed ozone depletion takes place over a much larger area, but these results indicate that the influence of solar protons on atmospheric ozone concentrations should not be ignored. (Auth.)

I-44476

Schnell, R.C., **Decrease of summer tropospheric ozone concentrations in Antarctica**, *Nature*, June 27, 1991 351(6329), p.726-729, 36 refs.

As an oxidant and a precursor for other highly reactive oxidants, ozone plays an important role in tropospheric photochemistry. In the upper troposphere, ozone absorbs infrared radiation and is thus an effective greenhouse gas. Here it is shown that surface ozone concentrations at the South Pole in the austral summer decreased by 17% over the period 1976-90. Over the same period, solar irradiance at the South Pole in Jan. and Feb. decreased by 7% as a result of a 25% increase in cloudiness. It is suggested that the trend in the summer ozone concentrations is caused by enhanced photochemical destruction of ozone in the lower troposphere caused by the increased penetration of ultraviolet radiation associated with stratospheric ozone depletion, coupled with enhanced transport of ozone-poor marine air from lower latitudes to the South Pole. (Auth.)

I-44486

Zhao, J.L., **Comparative research on environmental evolution between the region of antarctic Great Wall Station and China**, *Science in China*, Apr. 1991 34(4), p.502-512, 19 refs.

Through comparative analysis between environmental changes in the region of King George I. and characteristics of environmental evolution in different regions of China, the paper reveals the important similarity of the environmental evolution between the two regions. The fine correspondence between environmental changes of King George I. region, glacial activities on the mountainous terrain in western China, and the oscillation of the northern boundary of the subtropical zone in eastern China serve as evidence to support the interaction between the Northern and Southern Hemispheres. The uniformity of climatic changes of the King George I. region and changes of sea level of China and the world also supports the similarity of the trend of global changes in temperature since the Holocene. Macroscopic and integrated study of the whole earth is necessary to establish global scientific laws. (Auth. mod.)

I-44537

Sequeira, R., **Note on the consumption of acid through cation exchange with clay minerals in atmospheric precipitation**, *Atmospheric environment*, 1991 25A(2), p.487-490, 20 refs.

The first estimates developed in this study were obtained for three climatically different regions of the world: Antarctica (South Pole); continental Europe (north of the Alps); and the continental Mediterranean. From the calculations involving the ranges of the concentrations of potentially available strong acid and of clay minerals of low-to-medium cation exchange capacity for each of the three regions, it is suggested that the above process of acid consumption may almost always be insignificant in liquid (or liquified) precipitation over Antarctica and continental Europe. On the other hand, it is only under the most favorable conditions, involving the maximum stipulated cation exchange capacity of the clay minerals, that the same process could possibly lead to a maximum acid consumption in precipitation water up to 30% in the eastern Mediterranean region. The cation exchange process is also considered briefly in relation to the probable recycling of clay minerals of aeolian origin through evaporating clouds. Application of the first principles of cloud physics to the qualitative discussion suggests that clay minerals acting as freezing nuclei may have the best chance of participating in cation exchange, and hence in acid consumption in clouds. (Auth.)

I-44562

Wolff, E.W., Mulvaney, R., **Reactions on sulphuric acid aerosol and on polar stratospheric clouds in the antarctic stratosphere**, *Geophysical research letters*, June 1991 18(6), p.1007-1010, 25 refs.

Recent data from the antarctic stratosphere have suggested that HCl is present in sulphuric acid aerosol that remains liquid even at the lowest stratospheric temperatures. The available laboratory data show that cold, relatively dilute sulphuric acid is particularly able to take up HCl that is available for reaction provided the aerosol remains liquid. Fast heterogeneous reaction rates compared to those at mid-latitudes will produce active chlorine rapidly. Since the aerosol is present with significant surface area throughout the lower stratosphere, it should be very effective for heterogeneous reaction once temperatures drop. These surfaces, rather than PSCs, could host the initial conversion of Cl to its active form over the Antarctic. (Auth. mod.)

I-44563

Hofmann, D.J., Oltmans, S.J., Deshler, T., **Simultaneous balloonborne measurements of stratigraphic water vapor and ozone in the polar regions**, *Geophysical research letters*, June 1991 18(6), p.1011-1014, 15 refs.

Vertical profiles of stratospheric water vapor and ozone were measured together at McMurdo and South Pole Stations in Antarctica, and at Kiruna, Sweden, on several occasions during the austral spring of 1990 and the boreal winter of 1991. The antarctic data indicated that major dehydration had occurred on a continental scale over the winter stratospheric cloud formation period leaving only 2 to 3 ppmv water vapor between 11 and 19 km. Measurements before and after movement of the boundary of the polar vortex across McMurdo detected increases in both water vapor and ozone in the 17 to 20 km region. This injected layer was still observed at South Pole Station a month later, suggesting continental proportions. In early November, with the vortex still intact, South Pole measurements indicated a substantial degree of inhomogeneity in both water vapor and ozone in the lower stratosphere. In comparison, stratospheric water vapor measurements in the Arctic gave values of 4 to 5 ppmv, indicating the absence of the gross stratospheric dehydration effects obvious in the Antarctic, and they did not reveal significant structure except on one occasion with very cold temperatures (-90 C) at 25 km and nacreous cloud displays. (Auth.)

I-44564

Stolarski, R.S., Bloomfield, P., McPeters, R.D., Herman, J.R., **Total ozone trends deduced from Nimbus 7 TOMS data**, *Geophysical research letters*, June 1991 18(6), p.1015-1018, 15 refs.

The Total Ozone Mapping Spectrometer (TOMS) on the Nimbus 7 satellite has been measuring the total column amount of ozone over the globe for more than 11 years. Recent improvements in the data analysis have led to a technique for determining and removing drift in the calibration such that the data at the end of the record are precise to $\pm 1.3\%$ relative to the data at the beginning of the record. A statistical model, including terms for seasonal variation, linear trend, quasi-biennial oscillation, solar cycle and second-order autoregressive noise has been fit to the TOMS time series of total ozone data. The linear trend obtained when this statistical model is fit to the TOMS data averaged between 65N and 65S latitudes is -0.26% /year or -3% over the 11.6 year time period from Nov., 1978 through May, 1990. The trend is near zero at the equator and increases towards both poles. At 50N the annually averaged trend is -0.5% /year. The 50N trend over the 11.6 year time period shows a strong seasonal variation from more than -0.8% /year in winter and early spring (Feb. and Mar.) to about -0.2% /year in summer (July and Aug.).

I-44566

Dick, A.L., **Concentration and source of metals in the Antarctic Peninsula aerosol**, *Geochimica et cosmochimica acta*, July 1991 55(7), p.1827-1836, 45 refs.

Aerosol samples were collected at a remote site near the east coast of the Antarctic Peninsula during the austral summer of 1984/85. Filter samples were analyzed for Al (as a crustal reference element), marine cations (Na, K, and Ca), heavy metals (Cd, Cu, Pb, and Zn), and sulphate using atomic absorption spectrometry, isotope dilution mass spectrometry, neutron activation analysis, and ion chromatography. Ultraclean sample collection and analysis procedures used to avoid sample contamination are described in detail here. Mean concentrations of heavy metals were: Cd, 0.06 pg/cu m; Cu, 1.0 pg/cu m; Pb, 4.7 pg/cu m and Zn, 6.1 pg/cu m. These are the lowest concentrations yet determined in the troposphere, but for Pb and Zn they still indicate a significant enrichment over expected crustal concentrations. For these elements, estimated marine and volcanic contributions cannot account for this excess and suggest pollution as the dominant source even at this remote location. For Cd and Cu a dominant anthropogenic source cannot be ruled out, although current

estimates of crustal, marine, and volcanic emissions could account for levels determined. (Auth.)

I-44582

Weber, R.R., Montone, R.C., **Distribution of organochlorines in the atmosphere of the South Atlantic and antarctic oceans**, Long range transport of pesticides. Edited by D.A. Kurtz, Chelsea, MI, Lewis Publishers, 1990, p.185-197, 19 refs.

It is suggested that there is no information on the concentrations of chlorinated pesticides in the atmosphere of the Southwest Atlantic and its antarctic sector. This chapter is a report on the concentration and some aspects of the distribution of these compounds on a fixed sampling point on the Brazilian coast and the open ocean between 25 and 65S latitude transects of the South Atlantic and antarctic oceans.

I-44622

Crowley, T.J., North, G.R., **Paleoclimatology**, New York, Oxford University Press, 1991, 339p., Refs. p.274-322. Oxford monographs on geology and geophysics, No.16.

This work summarizes results from both observational and modeling studies in order to assess the general understanding of past climate change. Results from both Quaternary and pre-Quaternary studies and review simulations covering a large number of different models are discussed. Sea ice, Cenozoic temperature trends, deglaciation, the Miocene-Pliocene and Paleozoic glaciations in Antarctica, and the East and West Antarctic ice sheets are among the topics included in this study. (Auth. mod.)

I-44625

Hunter, I., **'Ship' wave clouds generated by the South Sandwich Islands**, *South Africa. Weather Bureau. Newsletter*, Mar. 1991 No.504, p.5-6.

The wave clouds generated by the islands Visokoi, Candlemas, Saunders, Montagu, Bristol and Thule, typical of isolated island peaks such as the volcanic Sandwich group, are shown in a visual image from the Soviet polar orbiting satellite *Meteor*. Details of meteorological interest are pointed out.

I-44626

Triegaardt, D.O., **Hemispherical circulation anomalies during March 1991**, *South Africa. Weather Bureau. Newsletter*, Mar. 1991 No.504, p.6-7, 1 ref.

The mean sea level pressure pattern of the Southern Hemisphere, and mean topography of the 500 hPa surface for Mar. 1991, are shown in two figures. Significant circulation anomalies occurred during the month at about 90E and 170W at the 500 hPa pressure level.

I-44627

Zurer, P.S., **Chlorine eroding Arctic as well as antarctic ozone, scientists confirm**, *Chemical and engineering news*, Mar. 19, 1990 68(12), p.22-23.

The chlorine catalyzed chemical reaction that has eroded ozone in Antarctica has just been documented in the Arctic as well. Man-made chlorine compounds, particularly chlorofluorocarbons (CFC's), are the cause of this destruction. Milder seasonal conditions in the north, however, have minimized the extent of the damage. In the warmer Arctic, clouds on which chlorine is converted to a destructive type are reduced by warmer temperatures.

I-44628

Brasseur, G.P., **Deepening, broadening trend**, *Nature*, Aug. 22, 1991 352(6337), p.668-669, 12 refs.

The results of a dozen recent (1989-1991) ozone depletion investigations, covering both hemispheres, are synthesized and tentative

explanations are promulgated for some of the findings. It appears that the middle atmosphere is more sensitive to anthropogenic chlorine than previously thought, that the role of chemical reactions on clouds and aerosols remains obscure, and that dilution processes require further evaluation. Hanging over the whole problem like a shroud are the yet to be discovered effects of the eruption of Mount Pinatubo.

I-44639

Hortal, M., Simmons, A.J., **Use of reduced Gaussian grids in spectral models**, *Monthly weather review*, Apr. 1991 119(4), p.1057-1074, 14 refs.

Integrations of spectral models are presented in which the "Gaussian" grid of points at which the nonlinear terms are evaluated is reduced as the poles are approached. A maximum saving in excess of one-third the number of points covering the globe is obtained by requiring that the grid length in the zonal direction does not exceed the grid length at the equator, and that the number of points around a latitude circle enables the use of a fast Fourier transform. Tests are reported for Eulerian and semi-Lagrangian barotropic models, mostly at T106 resolution, and a summary is given of experiments based on the T106 primitive-equation model used for operational forecasting at European Centre for Medium-range Weather Forecasts. The results show that such a reduced grid can be used for short- and medium-range prediction (and presumably also for climate studies) with no significant loss of accuracy compared with use of a conventional grid, which is uniform in longitude. The saving in computational time is between 20% and 25% for the T106 forecast model. There are also potential reductions in the memory requirement of the model and in the storage needed for the archiving of model results. Results are related in part to weather forecasting in the Southern Hemisphere, including Antarctica. (Auth. mod.)

I-44668

Simmons, A.J., Chen, J.B., **Calculation of geopotential and the pressure gradient in the ECMWF atmospheric model: influence on the simulation of the polar atmosphere and on temperature analyses**, *European Centre for Medium-Range Weather Forecasts. Technical report*, July 1990 No.66, 79p., 42 refs. For another version see 45-3478 or I-44471.

The spectral atmospheric model used for prediction at ECMWF (the European Centre for Medium-Range Weather Forecasts) is modified to change the spectrally-represented thermodynamic variable from temperature to the deviation of temperature from reference profile which depends analytically on pressure. There is only a minor change to the form of the thermodynamic equation, and the calculation of the pressure gradient is modified to eliminate some of the cancellation between terms which occurs in the standard formulation. At a lower resolution the revised scheme significantly improves southern hemispheric forecasts, with differences originating over Antarctica. There is also a small improvement over the Arctic. Sensitivity is much less at a higher resolution, but a minor advantage can still be seen in high southern latitudes. The benefit of the revised scheme at high latitudes is also captured by a simpler revision which retains temperature as the spectrally-represented variable, and uses a reference temperature only in the computation of the pressure-gradient terms in gridpoint space. Results indicate that much of the systematic difference in behavior between lower and higher resolution simulations at high latitudes can be removed by changing the pressure-gradient calculation. In particular, the new schemes correct a systematic tendency for erroneously high pressures east of the Ross Ice Shelf over Antarctica in lower resolution simulations at medium and longer time ranges. A small beneficial impact of the revised pressure-gradient calculation is found in a two-day data-assimilation experiment at a higher resolution. A more substantial improvement comes from using the reference temperature to reduce a systematic

error in the calculation of first-guess geopotential heights at standard pressure levels. Results from forecasts carried out after one and two days of assimilation show small improvements in the short and early medium range, but are inconclusive at longer time ranges. (Auth. mod.)

I-44713

Lefèvre, F., Cariolle, D., Muller, S., Karcher, F., **Total ozone from the TIROS operational vertical sounder during the formation of the 1987 "ozone hole"**, *Journal of geophysical research*, July 20, 1991 96(D7), p.12,893-12,911, 36 refs.

In this paper, total ozone maps obtained from the infrared radiances measured by the TOVS/HIRS2 instrument on board the NOAA 10 satellite are used to study the formation of the 1987 antarctic "ozone hole." In this study an improved version of the retrieval algorithm described by Muller and Cayla (1983) is used, with an approximate accuracy within 5-7% in clear sky conditions. Values determined from the TIROS operational vertical sounder (TOVS) are in good agreement with Dobson measurements in the mid-latitudes and with the ozonesondes launched from the antarctic stations during the Airborne Antarctic Ozone Experiment (AAOE). The agreement with the total ozone mapping spectrometer (TOMS) data at mid-latitudes is also good, but significant differences are found in early Sep. in the high latitudes. The ozone hole was already apparent in the TOMS map on the first days of Sep., while TOVS detected only localized ozone deep minima associated with optically thick polar stratosphere clouds (PSCs) and did not observe any circular depletion structure until Sep. 17. This discrepancy seems to be the consequence of high solar zenith angles and climatological errors in the TOMS algorithm, which tends to underestimate the ozone content in late winter. It is only in mid-Sep. that TOVS data show a rapid ozone decrease affecting the whole vortex. The low ozone amounts are first recorded in the vicinity of the PSCs detected in the ozone field and then spread into the vortex. TOVS observations suggest that a rapid ozone decrease might take place during or just after the formation of major water ice PSCs, which could be the direct consequence of both a sudden increase of free chlorine and an efficient denitrification occurring during type 2 PSC events. It is concluded that since the algorithm presented in this paper allows reliable ozone determinations in middle and high latitudes and accurate type 2 PSC detection, measurements from TOVS could play an important role in the ozone layer monitoring, especially in the wintertime polar regions where UV techniques are ineffective or affected by the lack of intense sunlight. (Auth. mod.)

I-44714

Stefanutti, L., **Polar stratospheric cloud observations over the Antarctic continent at Dumont d'Urville**, *Journal of geophysical research*, July 20, 1991 96(D7), p.12,975-12,987, 12 refs.

The Istituto di Ricerca sulle Onde Elettromagnetiche (IROE) two-channel elastic backscattering lidar, suitable for depolarization measurements, has been operated since Jan. 8, 1989, at the French antarctic base of Dumont d'Urville. A continuous monitoring of the stratosphere was performed, which permitted measurement of the evolution of the background stratospheric aerosols and of polar stratospheric clouds (PSC) throughout the year. The data reported in this article correspond to the first year of measurements. Depolarization of the lidar signals was measured in order to obtain information on the type of clouds observed and on their particle size distribution. Both low (<10%) and high (>10%) depolarization ratios were detected, permitting discrimination between PSC types according to the classification given by Toon et al. (1990). Temporal continuity and high time resolution of the lidar measurements are evidence for altitude decreases in the PSC layers over periods of a few hours. These motions, if linked to sedimentation processes, led to values of velocity (about 10 cm/s) compatible with large particles. (Auth. mod.)

I-44726

Kelly, K.K., Tuck, A.F., Davies, T., **Wintertime asymmetry of upper tropospheric water between the Northern and Southern Hemispheres**, *Nature*, Sep. 19, 1991 353(6341), p.244-247, 24 refs.

Upper tropospheric water vapor is particularly important despite its low mixing ratios, because it has large effects on the flux of infrared radiation near the tropopause and the distribution and supply of water vapor are central to cloud formation. From airborne measurements of total water (vapor plus ice crystal) during the winters of 1987 in the Southern Hemisphere and of 1988-89 in the Northern Hemisphere, the upper troposphere in middle, subpolar and high latitudes was, by a factor of 2-4, drier during austral winter than during boreal winter. As the lower latitude air moves towards the pole in austral winter, it is forced to cool to lower temperatures than in the north; more of the water vapor therefore condenses to form ice crystals, which then precipitate, thereby removing moisture from the air mass. Clearly, climate models must be able to reproduce this asymmetry if their predictions are to be credible. Asymmetry in water vapor implies an asymmetry in the production rate of the hydroxyl radical, and hence in the tropospheric chemistry of each hemisphere. (Auth. mod.)

I-44735

Walsh, J.J., **Arctic carbon sinks: present and future**, *Global biogeochemical cycles*, Dec. 1989 3(4), p.393-411, Refs. p.406-411.

Surface air temperatures of the arctic rose 1.2-1.5 C from 1880 to 1980, in contrast to a global warming of only 0.4-0.5 C; since 1980, six of the warmest years in the past century have been observed. Polar enhancement of a temperature rise, induced possibly by anthropogenic release of "greenhouse" gases, CO₂, N₂O, CH₄, and freons, to the atmosphere, is attributed to altered ice/snow albedo at sea level, i.e., melting of sea ice. A 5% decline of sea ice extent in the Arctic and Antarctic from 1979 to 1987 may have resulted in increased light availability within previously ice-covered polar regions. If such a short-term trend were to continue, it might lead to a negative biogeochemical feedback, i.e., enhanced extraction of atmospheric CO₂ during marine photosynthesis. As a consequence of deep vertical mixing in the antarctic ocean, however, primary production during the austral summer may have actually declined in response to a reduction in extent of meltwater regions, where stratified water columns allow carbon fixation tenfold that of open water. In contrast, within shallow adjacent seas of the Arctic Ocean, where shelf regions are tenfold larger than those of the Antarctic, the positive global consequences of greenhouse warming at polar latitudes will probably be felt first. Specifically, the Pacific-influenced regions of the Chukchi and East Siberian Seas, where sufficient nutrients and shallow depths prevail, now have annual primary productions of >200 g C/sq m/yr, tenfold that of other high arctic shelves, and may supply 50% of the carbon respiration demands within the halocline of the deep Canadian and Eurasian basins via brine-mediated runoff. Continued melting of ice in the Arctic could increase by an order of magnitude the present CO₂ sink of approx. one million t C/yr. (Auth. mod.)

I-44779

Deshler, T., Hofmann, D.J., **Ozone profiles at McMurdo Station, Antarctica, the austral spring of 1990**, *Geophysical research letters*, Apr. 1991 18(4), p.657-660, 8 refs.

Vertical profiles of ozone and temperature were measured on 40 occasions during the austral spring of 1990 at McMurdo Station and once again near record levels of ozone depletion were observed. Total ozone decreased from 260 DU in late Aug. to its minimum value of 145 DU on Oct. 9, when the ozonesonde was at its lower detection limit from 15 to 16.5 km. Ozone reductions were observed almost exclusively between 12 and 20 km, with a half life of 20 days. This is similar to previous years. Although McMurdo was within the

polar vortex for most of the period, there were several occasions when the edge of the vortex was over McMurdo. During these periods, ozone above 20 km approximately doubled, but below 20 km remained relatively unchanged. (Auth.)

I-44780

Newman, P., Stolarski, R., Schoeberl, M., McPeters, R., Krueger, A., **1990 antarctic ozone hole as observed by TOMS**, *Geophysical research letters*, Apr. 1991 18(4), p.661-664, 18 refs.

The 1990 antarctic ozone hole matched the record 1987 ozone hole in depth, duration, and area. During the formation phase of the hole (Aug.) total ozone values were the lowest yet recorded. The decline rate approximately matched the record 1987 decline, and reached a minimum of 125 Dobson Units on Oct. 4, 1990. October total ozone averages were marginally higher than in 1987. As during 1987, the 1990 total ozone values within the hole slowly and steadily increased during the mid-Oct. through Nov. period. The ozone hole breakup was the latest yet recorded (early Dec.), with low ozone values persisting over the pole through Dec., setting a record low for Dec. average polar ozone. Temperatures were near average during the early spring, but were below normal for the late spring. Temperatures in the early spring of 1990 were substantially warmer than those observed in the early spring of 1987. (Auth.)

I-44781

Keys, J.G., Gardiner, B.G., **NO₂ overnight decay and layer height at Halley Bay, Antarctica**, *Geophysical research letters*, Apr. 1991 18(4), p.665-668, 15 refs.

Ground-based measurements of stratospheric slant column NO₂ amounts made at Halley Bay in 1987 are compared with ozone and temperature profiles from balloon-borne sondes. Sunrise-to-sunset (am/pm) ratios of NO₂ have been calculated in autumn and spring by using the sonde data in conjunction with a simple photochemical model for the conversion of NO₂ to N₂O₅. These calculations can be reconciled with the spectrometric measurements of column NO₂, provided that the bulk of the NO₂ layer is assumed to lie at a height of about 25 km. The small amounts of NO₂ that are present in the stratospheric column during the first 6 weeks of spring are therefore confined to altitudes above the ozone depletion region. Slow recovery of the NO₂ column in spring compared with the rate of its decline in autumn indicates slow photolysis of depleted levels of N₂O₅ inside the polar vortex. (Auth.)

I-44782

Thayer, J.P., Killeen, T.L., **Vorticity and divergence in the high-latitude upper thermosphere**, *Geophysical research letters*, Apr. 1991 18(4), p.701-704, 16 refs.

Measurements made from the Dynamics Explorer-2 satellite in Nov. 1981 through Jan. 1982 and Nov. 1982 through Jan. 1983 have been analyzed to determine the divergence and vertical component of vorticity of the high-latitude neutral wind field in the upper thermosphere for quiet and active geomagnetic conditions and for both northern (winter) and southern (summer) hemispheres. This analysis provides the first experimental determination of the polar thermosphere, and provides insight into the relative strengths of the different sources of momentum and energy responsible for driving the winds. The principal findings from this work include the following: the mean neutral wind pattern is dominated by rotational flow rather than by divergent flow, with a typical vorticity:divergence ratio of about 2:1 for active conditions and about 4:1 for quiet conditions. Comparison of the divergence and vorticity patterns for quiet and active conditions indicates that the divergent component of the neutral flow intensifies more significantly with increasing geomagnetic activity than does the rotational component. (Auth.)

I-44785

Hansen, A.R., Sutera, A., Tribbia, J.J., **Relation of multiple flow regimes to the climatic error in general circulation models: Southern Hemisphere winter**, *Journal of the atmospheric sciences*, June 1, 1991 48(11), p.1329-1335, 19 refs.

Extended perpetual July integrations of the NCAR Community Climate Model, versions CCM1 and CCM0, at rhomboidal wavenumber 15 truncation are examined to determine the influence of the models' ability to capture observed planetary-scale flow regimes on their level of climatic error. The Southern Hemisphere (SH) was chosen as the domain of study because the absence of major sources of stationary zonally asymmetric forcing make it a relatively less complicated case compared to the Northern Hemisphere. CCM1 exhibits a distinct deficit in grid point 500 mb height variance and insufficient persistence at large planetary-scale wave amplitude, compared to observations or to CCM0. This deficit appears to be connected with the failure of CCM1 to simulate the observed planetary-scale flow regimes in the SH, exemplified in observations as bimodality in the wavenumber 3 amplitude. In particular, CCM1 does not achieve the observed large amplitude wavenumber 3 regime. On the other hand, CCM0 does capture the wave amplitude bimodality and coincidentally has larger grid point height variance and greater persistence at large amplitude than CCM1. The CCM1 perpetual July SH climate resembles observed SH summer more closely than observed winter in terms of the wavenumber 3 amplitude distribution and the kinetic energy spectrum. (Auth.)

I-44786

Ziemke, J.R., Stanford, J.L., **One-to-two month oscillations: Observed high-latitude tropospheric and stratospheric response to tropical forcing**, *Journal of the atmospheric sciences*, June 1, 1991 48(11), p.1336-1347, 26 refs.

Careful spectral, correlation and coherence analyses of low-frequency fluctuations in global geopotential height data are presented. Attention is paid to proper statistical assessments. The main points are: 1) one-to-two month oscillating quasi-stationary wavetrains have recently been reported in the extratropical Southern Hemisphere troposphere, as far south as the edge of Antarctica. However, only weak correlations were observed with the supposed tropical forcing region. The present paper shows analyses of other tropical datasets which reveal clear correlation between low latitude source regions and the SH extratropical troposphere. 2) The present work includes evidence of temperature fluctuations propagating initially quasi-horizontally towards higher latitudes from the Indonesian tropical troposphere, along the bottom of the tropopause to near 35S. At this latitude, stratospheric winter westerlies allow vertical propagation of the 1-2 month perturbations up to the middle stratosphere where the wavetrain arches equatorward and upward to the stratopause. 3) Finally, Eliassen-Palm flux diagnostics for the SH stratosphere reveal that while the 1-2 month perturbations occasionally cause significant forcing of the zonal mean wind \bar{U} , on the long term average only about 10% of $\Delta \bar{U} / \Delta t$ can be attributed directly to these low-frequency eddies. Data used in this study includes the antarctic continent. (Auth. mod.)

I-44787

Mechoso, C.R., Farrara, J.D., Ghil, M., **Intraseasonal variability of the winter circulation in the Southern Hemisphere atmosphere**, *Journal of the atmospheric sciences*, June 1, 1991 48(11), p.1387-1404, 22 refs.

The intraseasonal variability of the Southern Hemisphere stratosphere and troposphere is studied using multilevel geopotential height data for nine winters (1979-87). The study uses empirical orthogonal function (EOF) analysis of unfiltered data at five tropospheric and five

stratospheric levels. The four leading EOFs at all tropospheric levels exhibit the pattern previously detected at 500 mb. Study of the corresponding principal components (PCs) at each level shows that the quasi-stationary anomalies associated with the leading EOFs are equivalent barotropic and exhibit no preference for early, middle or late winter. The five leading EOFs in the stratosphere fall into two classes. The first three EOFs at all levels form the first class. This class represents anomalies that are dominated by zonal wavenumber one (wave 1), exhibit strong westward tilt with height, and travel slowly eastward or remain stationary. Most cases of large, persistent PC values for this class occur in early winter. The fourth and fifth EOFs form the other class. This class represents anomalies that are dominated by wavenumber two, and tilt noticeably, but less strongly than the first class, westward with height. These anomalies tend to develop mostly in late winter and to travel eastward more rapidly. The intraseasonal variability in the stratosphere resides therewith, as expected in structures dominated by the longest planetary waves. No systematic connections between tropospheric and stratospheric persistent anomalies are apparent in the dataset. (Auth.)

I-44838

Ryzhakov, L.IU., Savitskiĭ, G.B., Riabkov, G.E., **Seasonal characteristics of baric formation movement in the Southern Hemisphere during typical atmospheric macroprocesses** [Sezonnye osobennosti dvizheniia baricheskikh obrazovaniĭ v IUzhnom polusharii pri tipovykh atmosferykh makroprotsessakh], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.70-74, In Russian. 6 refs.

Cyclone and anticyclone trajectory maps for 1965-1984 summer periods are compared to winter data showing significant variation in baric formation movement from season to season. An analysis is made of seasonal changes of the most probable trajectories during typical macroprocesses.

I-44839

Dolgin, M.I., Rozanov, E.V., **Solar radiation studies in the cloudy atmosphere of Antarctica** [Issledovanie solnechnoi radiatsii v oblachnoi atmosfere Antarktidy], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.75-83, In Russian. 11 refs.

Radar observations of cloud fields at Molodezhnaya Station disclosed the dependence of attenuation of global solar radiation on cloud density. A comparison is made of solar radiation measurements and values obtained through a spectral model of atmospheric radiation showing similar results.

I-44841

Loopmann, A.A., Klovov, V.D., **Formation of water basins in Schirmacher Ponds during summer 1983-1984** [Formirovanie stoka vodoemov oazisa Shirmakhera v letnii sezon 1983/84 g.], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.93-105, In Russian. 3 refs.

Data are presented concerning the water level, flow rate, volume and runoff layer from 5 basins investigated in the Schirmacher Ponds region in the summer of 1983-1984. The water level ranged from 0.5 to 1.0 m; the flow rate, 0.4-1.3 cu m/s; the runoff layer, at the basins' depth of 230-250 m, averaged 150 mm, increasing to 250 mm in areas 150-200 m deep; the runoff rate from the shelf ice water basin, at 100 m, reached 800 mm. The total runoff volume in relation to the Ponds' surface area was 5 to 135 m.

I-44842

Loopmann, A.A., **New data on the regime of Schirmacher Ponds** [Novye dannye o rezhime ozer oazisa Shirmakhera], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1990 Vol.87, p.106-126, In Russian. 14 refs.

From observations carried out of the runoff rate within the drainage basins of Schirmacher Ponds during the summer of 1983-1984, new data is presented on the extent of ice cover, radiation regime and temperature. Results are shown in tables and graphs.

I-44847

Dutton, E.G., Stone, R.S., Nelson, D.W., Mendonca, B.G., **Recent interannual variations in solar radiation, cloudiness, and surface temperature at the South Pole**, *Journal of climate*, Aug. 1991 4(8), p.848-858, 20 refs.

Incoming global solar irradiance measured at the surface at the South Pole unexpectedly decreased steadily by 15% from 1976 through 1987 during the late austral summer season, whereas no trend is apparent for Sep. through Dec. February's irradiance trend, -1.24%/yr on the average, is statistically significant at greater than the 99.9% confidence level. The irradiance observations were made continuously with the same calibrated sensor and are confirmed by a second simultaneous solar irradiance measurement series. Associated changes in seasonal sky cover (clouds) and surface air temperature were also observed. Seasonally increasing cloud cover is directly associated with the decreasing irradiance trends, whereas temperatures show a warming trend significant only in Mar., followed by a cooling trend significant only in May. Cloudiness and temperature records for 32 years suggest that the observed cloudiness trend began in the late 1970s, while the temperature trends become apparent only in the early 1980s. The observed sensitivity of total global solar irradiance to the change in sky cover is roughly six percent per one-tenth and is shown to vary spectrally. Although the annual averages of solar irradiance at the South Pole display an overall decrease between 1976 and 1989, the most recent years in this period show some recovery from earlier declines. Likewise, the downward trends in Jan. and Feb. irradiance diminished in 1988 and 1989. (Auth.)

I-44857

Smith, R.H., Leu, M.T., Keyser, L.F., **Infrared spectra of solid films formed from vapors containing water and nitric acid**, *Journal of physical chemistry*, July 25, 1991 95(15), p.5924-5930, 26 refs.

Infrared spectra have been recorded at 188 K for crystalline mono- and trihydrates of nitric acid formed by vapor deposition. In addition, spectra of fully deuterated forms of these same compounds have been obtained. These spectra have been interpreted in terms of the known ionic structures of the hydrates and the known spectra of oxonium and nitrate ions. Two other less stable solids were formed, a molecular hydrogen-bonded HNO₃-H₂O complex, stable only at temperatures below 120 and 150 K, and a substance thought to be a crystalline mixture of trihydrate and ice which sometimes formed from water-rich vapors and which upon pumping and/or warming could be converted into crystalline trihydrate. While these four substances appear to be the four species recently reported by Ritzhaupt and Devlin, their allocation of structures to two of them is disputed, in particular, their claims that a stable dihydrate exists. The relevance of the results to the stratospheric "ozone hole" problem, as exemplified over Antarctica, is discussed. (Auth. mod.)

I-44864

Rosen, J.M., Kjome, N.T., **Balloon borne observations of backscatter, frost point and ozone in polar stratospheric clouds at the South Pole**, *Geophysical research letters*, Feb. 1991 18(2), p.171-174, 7 refs.

Concurrent backscatter and ozone measurements were made with near-simultaneous frost point soundings over the South Pole when the

center of the 1990 winter vortex was at or very near that location. The initial water vapor concentration in the stratosphere was about 5 ppmv and decreased to about 1.5-2.0 ppmv as cooling took place. By mid-July the stratospheric temperature had decreased to the frost point and heavy polar stratospheric cloud (PSC) activity was observed, presumably due to the condensation of water vapor. The lowest water vapor concentrations observed correspond to saturated air at the lowest temperatures encountered. The slow recovery of the water vapor concentration during spring warming indicates that the 12 to 22 km altitude region in the vortex is not readily penetrated by outside air. The observed large decrease in PSC backscatter above about 14 km before the stratosphere began to warm is consistent with loss of particles by sedimentation leading to significant dehydration and denitrification. The region of PSC activity in July is noted to be in the same region in which ozone depletion and the persistent dehydration is observed later in the year. At the end of Aug. heavy PSC activity was observed in the lower stratosphere and upper troposphere, consistent with earlier observations from NASA aircraft. These lower clouds were in a region that apparently was still experiencing cooling. No compelling evidence was found supporting earlier claims that PSC layers are anti-correlated with ozone inside the vortex. (Auth.)

I-44865

Mancini, E., Visconti, G., Pitari, G., Verdecchia, M.,
Estimate of the antarctic ozone modulation by the QBO,
Geophysical research letters, Feb. 1991 18(2), p.175-178,
20 refs.

The possible effects of the QBO on the ozone distribution have been studied including in a 2D model a parameterization of Kelvin and Rossby-gravity wave forcing in the lower equatorial stratosphere. A chemical code complete with heterogeneous reactions allows a simulation of the ozone depletion due to the increase of stratospheric chlorine. With this model the authors study the possible modulation of the secular trend in the antarctic ozone hole by QBO. When heterogeneous chemistry is not included, the model shows a polar ozone oscillation comparable to that deduced from measurements in 1970-1975. When heterogeneous reactions are taken into account, the model predicts a larger ozone oscillation in the Southern Hemisphere comparable to that obtained from recent observations. This behavior seems to point out a QBO-induced temperature effect and its feedback on PSC with the activation of heterogeneous chemistry. (Auth.)

I-44866

Legrand, M., Feniet-Saigne, C., **Methanesulfonic acid in south polar snow layers: a record of strong El Niño?,**
Geophysical research letters, Feb. 1991 18(2), p.187-190,
21 refs.

In this paper a detailed study is presented of methanesulfonic acid (MSA) and non-sea-salt sulfate (nss-SO₄) content in recent south polar precipitation. These two species are major oxidation products of dimethylsulfide (DMS) which is mainly produced by marine biota. The nss-SO₄ content of south polar snow layers deposited over the 1922-1984 time period remained rather stable except for short-term increases after the Mt Agung (1963) and the El Chichon (1982) eruptions. The MSA profile also shows over the same time period several sporadic, 0.5 to 2 years, increases (2 to 10 times background level). Taking into account an uncertainty of 1-3 years in the dating of snow layers, all these MSA events seem to be correlated to major ENSO (El Niño-Southern Oscillation) events having occurred over the last sixty years. The relatively high MSA/nssSO₄ weight ratios (R) observed in the corresponding snow layers suggest that these events reflect enhanced DMS emissions from the antarctic ocean. This suggested connection between ENSO and high DMS marine emissions at high southern latitudes is discussed in terms of atmospheric and oceanic circulation. (Auth.)

I-44879

Kim, J.W., Kim, Y.D., Lee, B.Y., **Study on the upper atmosphere using Fabry-Perot interferometer at King Sejong Station, Antarctica,** *Ocean research*, June 1991 13(1), p.1-11, In Korean with English summary. 23 refs.

In order to study the neutral temperatures and winds in the antarctic thermosphere, a 6-inch high-resolution Fabry-Perot interferometer was installed at King Sejong Station in Jan. 1989. Interferometric measurements during Mar. 1989 showed elevated thermospheric temperatures. These high temperatures may be partly due to the major solar event that occurred in Mar. 1989. Wind vectors constructed from neutral wind components measured at the time showed some definite trends in direction and magnitude. (Auth. mod.)

I-44880

Lee, B.Y., **Study on the natural environments of Antarctica,** *Ocean research*, June 1991 13(1), p.51-69, In Korean with English summary. Refs. p.68-69.

The climate of Antarctica is greatly influenced by the circumpolar antarctic sea, the ranges of sea ice, and ice sheets of the Antarctic. The weather of Antarctica and surrounding subpolar ocean is dominated by a tropospheric circulation system. Large temperature gradients between the cold continent and the relatively warm ocean continually create low-pressure areas (cyclones) over the ocean which travel eastward or south-eastward with the prevailing winds. The cyclones provide the mechanism for meridional exchange of cold polar air with warm moist air from lower latitudes, and thereby transport moisture into the south polar region. These characteristics of the antarctic natural environments affect the change of global environments. (Auth. mod.)

I-44882

Tominaga, T., Makide, Y., **Halocarbons in the atmosphere: trends and vertical profiles,** *Chemical Society of Japan. Journal*, May 1991 No.5, p.351-357, In Japanese with English summary. 22 refs.

Very stable halocarbons such as chlorofluorocarbons (CFCs) and carbon tetrachloride are responsible for both the stratospheric ozone depletion and the global warming as they accumulate in the atmosphere. Background atmospheric concentrations of CFCs and other halocarbons have been determined accurately and precisely at surface level both in the Northern Hemisphere (Hokkaido) and in the Southern Hemisphere (Antarctica). The atmospheric concentrations of CFC-11 and CFC-12 have been increasing by 4%/yr since 1979; the CFC-113 concentration tends to increase much faster (10-20%/yr). Vertical profiles of major CFCs up to the stratosphere, as determined in balloon experiments (grab-sampling and cryogenic sampling) over Japan, reflect their behavior in the stratospheric UV photolysis. (Auth.)

I-44883

Hirota, M., Aoki, T., Makino, Y., Murayama, S.,
Atmospheric methane concentration between Tokyo and Syowa Station, Antarctica, *Chemical Society of Japan. Journal*, May 1991 No.5, p.358-360, In Japanese with English summary. 9 refs.

Air samples were collected on board the icebreaker *Shirase* at intervals of about 5 deg in latitude between Tokyo and Showa Station late in 1987 and 1988, and methane was measured by a GC-FID method. South of the intertropical convergence zone, mixing ratios were almost constant through Showa Station. Their mean values and standard deviations were 1.578 and 0.008 ppm in 1984, 1.611 and 0.012 ppm in 1987, and 1.628 and 0.008 ppm in 1988. The average increase rate of these mean values was 0.013 ppm/y from 1984 to 1988. (Auth. mod.)

I-44889

Guo, J.X., **Analysis of strong wind processes and action of cyclones and fronts during January-February 1990, over Prydz Bay, Eastern Antarctica**, *Antarctic research*, 1991 3(1), p.39-46, In Chinese with English summary. 7 refs.

Based on the surface weather charts of the Australian Meteorological Center, the antarctic meteorological center at Molodezhnaya Station, and satellite cloud images from NOAA 10 and 11, the centers of cyclones were determined for Jan. and Feb. 1990 over Prydz Bay and vicinity. The active characteristics of these cyclones are discussed. The synoptic systems, synoptic situations and satellite images which correspond with strong winds are analyzed, showing the following: 26 cyclones activated in the area, almost one every other day; the number of cyclones, and their average speed, were greater in Jan. than in Feb., north of 60S; fronts moving southward have a close relationship with the high pressure ridge over 70E, and strong winds are interrelated with the cell cloud area of frontal cloud zones in the satellite images. (Auth. mod.)

I-44890

Zhang, J.D., Qiu, J.H., Wang, H.Q., **Measurements and analysis of aerosol and cloud optical properties at the Great Wall Station on Antarctica**, *Antarctic research*, 1991 3(1), p.47-53, In Chinese with English summary. 9 refs.

Aerosol and cloud optical depths and aerosol size distribution at the Great Wall Station, measured by joint sunphotometer and hemispheric radiometer from Dec. 1988 to Mar. 1989, are analyzed. Results show that there are large cloud and aerosol optical depths with mean values of 12.7 and 0.094, respectively, during summer. (Auth.)

I-44891

Qu, S.H., Yamanouchi, T., **Variations of atmospheric carbon dioxide concentration at Syowa Station, Antarctica**, *Antarctic research*, 1991 3(1), p.54-58, In Chinese with English summary. 1 ref.

Analysis of data on atmospheric carbon dioxide concentration variations and the annual mean air temperature at Showa Station in 1984-1988, shows the following results: the annual mean values of atmospheric CO₂ concentration increase gradually to 342.59, 343.80, 345.15, 346.83 and 348.82 ppmv for 1984, 1985, 1986, 1987 and 1988, respectively. Year to year growth rates are 1.21, 1.35, 1.68 and 1.99 ppmv/yr, for 1984-1985, 1985-1986, 1986-1987 and 1987-1988, respectively. Seasonal variations are observed, with maximum concentration in spring and minimum concentration in autumn. The increase of the CO₂ concentration annual mean value is consistent with that of the annual mean value of air temperature. (Auth. mod.)

I-44914

Rivin, I.G., Turikov, V.G., **Modeling of the atmospheric climate at the peak of the last glaciation**, *Akademiia nauk SSSR. Izvestiia. Atmospheric and oceanic physics*, July 1990 25(12), p.911-917, 21 refs.

Results obtained from three-dimensional modeling of the atmospheric climate 18,000 years ago with allowance for seasonal variations are presented. CLIMAP data are used for lower boundary conditions. A brief description of the hydrodynamic model that is used is presented. The zonal-average fields and global-mean series of atmospheric characteristics for the present-day climate and the peak of the last glaciation are presented. The results are compared with empirical data and results obtained by other investigators. The global range in this study extends through both polar regions. (Auth.)

I-44915

Theron, G.F., Harrison, M.S.J., **Atmospheric circulation over Gough and Marion Islands**, *South African journal of science*, July 1991 87(7), p.331-338, 39 refs.

Harmonic analysis has been applied to monthly mean values and standard deviations of thermodynamic and kinematic circulation parameters over Gough and Marion Is. There were distinct differences in seasonal cycles of the circulations over the two islands, which were related to their locations with respect to land masses and temperate cyclone tracks. Over Gough I., which lies north of the major cyclone tracks, the circulation resembled that over subtropical southern Africa. Annual cycles were generally dominant but large-amplitude, semi-annual cycles occurred both in low-level pressures and in zonal and meridional components through the troposphere. Over Marion I., which lies within the storm belt, the seasonal cycle was more complex than at Gough I. Phases of annual cycles in given parameters at the two stations did not always correspond, but those of the semi-annual cycles were generally in accord. Meridional winds were modulated, however, on semi-annual cycles of inverse phases across the two sites, an inversion which resulted from longitudinal displacements of a standing wave over the South Atlantic Ocean. The wave lay anomalously westward in Feb. and in Aug. (Auth.)

I-44918

Egger, J., **On the mean atmospheric circulation over Antarctica**, *Geophysical and astrophysical fluid dynamics*, July 1991 58(1-4), p.75-90, 13 refs.

The south-easterly surface flow down the slopes of Antarctica induces a transfer of westerly angular momentum to the atmosphere, which must be removed from the antarctic domain by atmospheric transports. It is suggested that synoptic eddies protruding from the northern baroclinic zone into the polar regions are modified by the topography such that they are able to perform these meridional transports. A simple linear two-layer model of the axisymmetric circulation of Antarctica is presented where the eddy effects are incorporated via a K-ansatz. It is shown that qualitatively realistic mean flow patterns can be obtained with this model. The limitations of this approach are exposed. (Auth.)

I-44919

Bromwich, D.H., **Mesoscale cyclogenesis over the southwestern Ross Sea linked to strong katabatic winds**, *Monthly weather review*, July 1991 119(7), p.1736-1752, 36 refs.

Two years of automatic weather station (AWS) observations and satellite images have been used to study mesoscale cyclogenesis along the Transantarctic Mountains. Twice-daily regional sea-level pressure analyses revealed the frequent formation of mesoscale cyclones adjacent to two regions where the discharge of cold boundary-layer air from East Antarctica is concentrated: near Terra Nova Bay/Franklin I. and Byrd Glacier. Between one and two new vortices on average formed each week in the former location with weak frequency maxima in Dec.-Mar. and Aug.-Sep. There was a large difference between the cyclogenetic activity in the two years. The AWS array expanded in 1985 and resolved another cyclogenetic area near Byrd Glacier. This feature was half as active as the Franklin I. area and exhibited many of the same characteristics. About half of the Byrd Glacier cyclones developed simultaneously with vortices near Franklin I. These developments are the result of a dry baroclinic process, with marked baroclinicity and weak cyclonic vorticity appearing to be boundary-layer prerequisites. There is little consistent upper-air support associated with the cyclogenesis, but such factors often play a key role in subsequent storm evolution. The evidence suggests that synoptic forcing plays a significant genetic role via troughs attached to, but ahead of, maritime cyclones centered to the northwest of the Ross Sea. (Auth.)

I-44935

Fiocco, G., **On the temperature dependence of polar stratospheric clouds**, *Geophysical research letters*, Mar. 1991 18(3), p.424-427, 8 refs.

Polar stratospheric clouds were frequently observed by lidar at the Amundsen-Scott South Pole Station during May-Oct. 1988. The dependence of the backscattering cross section on the temperature can be referred to transitions of the HNO₃/H₂O system. It appears possible to distinguish the pure trihydrate from the mixed ice-trihydrate phase in the composition of the aerosol and, in some cases, to bracket the HNO₃ and H₂O content of the ambient gas, and to provide indications on the size of the particles. (Auth.)

I-44965

Pitari, G., Visconti, G., **Odd nitrogen removal on background sulfate aerosols: implications for the ozone hole**, *Geophysical research letters*, Oct. 1991 18(10), p.1853-1856, 17 refs.

A sensitivity study is carried out for the dependence of the polar ozone loss rate on the value of the sticking coefficient *gamma* for the reaction converting odd nitrogen into nitric acid on sulfate aerosols. In this study the authors use a 2D model including nitrogen and chlorine families along with an explicit condensation mechanism for polar stratospheric clouds (PSC) and a fixed distribution of background sulfate aerosols in the lower stratosphere. If only background aerosols are included, negligible changes in total ozone are observed (up to about 1%) when *gamma* is increased from 0.02 to 0.14. If PSCs are added the same test produces a significant reduction of the ozone hole depth in Antarctica. (Auth.)

I-44966

Jensen, E.J., Toon, O.B., Hamill, P., **Homogeneous freezing nucleation of stratospheric solution droplets**, *Geophysical research letters*, Oct. 1991 18(10), p.1857-1860, 12 refs.

The classical theory of homogeneous nucleation is used to calculate the freezing rate of sulfuric acid solution aerosols under stratospheric conditions. The freezing of stratospheric aerosols is important for the nucleation of nitric acid trihydrate particles in the arctic and antarctic stratospheres. In addition, the rate of heterogeneous chemical reactions on stratospheric aerosols may be very sensitive to their state. The calculations indicate that homogeneous freezing nucleation of pure water ice in the stratospheric solution droplets would occur at temperatures below about 192 K. However, the physical properties of H₂SO₄ solution at such low temperatures are not well known, and it is possible that sulfuric acid aerosols will freeze out at temperatures ranging from about 180-195 K. It is also shown that the temperature at which the aerosols freeze is nearly independent of their size. (Auth.)

I-44967

Nichol, S.E., Coulmann, S., Clarkson, T.S., **Relationship of springtime ozone depletion at Arrival Heights, Antarctica, to the 70 hPa temperatures**, *Geophysical research letters*, Oct. 1991 18(10), p.1865-1868, 15 refs.

The total ozone measurements from Arrival Heights (78S) show severe depletion occurring in 1989 and 1990, with the minimum ozone values of 164 and 144 Dobson Units (DU) being measured in early Oct. These depletions represent the loss of about half of the total ozone column. Much milder ozone depletion was observed in the 1988 spring, with the minimum of 217 DU being observed on Sep. 23. The ozone depletion mechanism is linked to the occurrence of polar stratospheric clouds, and hence with low temperatures in the lower stratosphere in early spring. The Arrival Heights data show a shift in the ozone-temperature relationship over the last three years, with the same total ozone values associated with progressively higher temperatures from year to year. (Auth.)

I-44968

Frederick, J.E., Alberts, A.D., **Prolonged enhancement of surface ultraviolet radiation during the antarctic spring of 1990**, *Geophysical research letters*, Oct. 1991 18(10), p.1869-1871, 9 refs.

Measurements of the ultraviolet solar spectral irradiance from the earth's surface at Palmer Station show behavior in the spring of 1990 which differs from that observed during the seasonal ozone depletions of the previous two years. As the austral spring progresses, the sun rises in the sky, and the duration of daylight increases up to the summer solstice on Dec. 21. This is naturally accompanied by increasing ultraviolet irradiances irrespective of the behavior of column ozone. If, as in 1988, the ozone depletion is confined to Oct. and early Nov., the irradiances at local noon may remain at or below values characteristic of an unperturbed summer solstice. However, in 1990 enhanced irradiances persisted well into Dec. The largest values observed at a wavelength of 306.5 nm were approximately double those expected at summer solstice with an unperturbed ozone amount. (Auth.)

I-44971

Peel, D.A., **Polar ice cores and climate history**, *Weather*, Apr. 1991 46(4), p.95-102, 6 refs.

The value of ice cores as depicitors of past climates is reviewed in terms of the origin of ice core records; the evidence they hold of past climates; the cause and effect evidence of climate and glacial cycles; rapid fluctuations of climate during the last ice age; and future prospects. Ice cores from both Antarctica and Greenland are used as the basis of the discussion.

I-44972

King, J.C., **Global warming and Antarctica**, *Weather*, Apr. 1991 46(4), p.115-120, 16 refs.

Simulations of equilibrium climate response to increased CO₂ concentrations suggest that the greatest observed warming will occur in the polar regions. Examination of temperature and sea-ice records from Antarctica shows no evidence for enhanced warming. However, the records are short and show much interannual variability, making detection of small trends very difficult. Furthermore, recent simulations of the transient effects of a steady increase in CO₂ concentration suggest that the thermal inertia of the southern ocean will delay the onset of warming in Antarctica. (Auth.)

I-44999

Pinto, J.P., Khalil, M.A.K., **Stability of tropospheric OH during ice ages, inter-glacial epochs and modern times**, *Tellus*, Nov. 1991 43B(5), p.347-352, 28 refs.

Hydroxyl (OH) radicals remove many man-made and natural gases from the atmosphere and therefore play a key role in global tropospheric chemistry. Recent increases in CH₄ and CO have caused concern that the levels of OH may decrease, thus reducing the capacity of the atmosphere to remove and control man-made pollutants. OH concentrations were calculated over a wide range of climatic conditions to examine its long term stability and to determine the major factors that may cause changes in its levels. A one-dimensional photochemical model, the concentrations of CH₄ and N₂O from polar ice cores and the current understanding of the sources and sinks of CO, NO_y and other gases involved in OH chemistry were used. It is found that mean OH concentrations are stabilized against changes, even though the climatic conditions and atmospheric trace gas composition change considerably between ice-ages, inter-glacial periods and the present. In these transitions, the more rapid destruction of OH from increased CH₄ and CO is compensated by increases in the production processes. Calculations indicate that only a small part of the 5-fold increase of methane between the present and the peak of the last ice age is due to changes in OH levels. (Auth.)

I-45043

Crickmore, R.I., Dudeney, J.R., Rodger, A.S., **Vertical thermospheric winds at the equatorward edge of the auroral oval**, *Journal of atmospheric and terrestrial physics*, June/July 1991 53(6/7), p.485-492, 19 refs.

A study has been made of vertical thermospheric winds in the vicinity of Halley Station. Strong downward winds, up to 50 m/s, are frequently observed when the station is located under the equatorward edge of the oval. Whether there is a net downwards motion throughout the night is discussed, and it is concluded that this is probable. The consequent effects upon thermospheric composition and ionospheric electron concentration are also discussed, and related to observations made at Halley. (Auth.)

I-45057

Cazeneuve, H., **Influence of solar variability on climate** [Influencia de la variabilidad solar en los climas], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1991 No.383, 27p., In Spanish with English and French summaries. 15 refs.

Observations on the effect of the sun on weather and climate are presented. Comparison between data of tropospheric circulation and those of the interplanetary medium and geomagnetic disturbances, obtained at Belgrano II Station for the period May 1973-Dec. 1974 and 1983-1984, has been made. An apparent connection among tropospheric variables, strength of the interplanetary magnetic field and geomagnetic index Ks was found in the course of this study. Even though convincing arguments on the sun-climate relationship do not exist, inferences are found to be persuasive. Similar variations among quantities of different nature (tropospheric and interplanetary), permit one to argue for a certain association between those variations. (Auth. mod.)

See also:

- A-43833 A-44158 A-44763 B-43200 B-43201 B-43202 B-43203
- B-43342 B-43512 B-43655 B-43664 B-43675 B-44299 B-44544
- B-44586 B-44831 C-43813 C-44772 E-42991 E-43290 E-43609
- E-43671 E-43699 E-43921 E-44251 E-44334 E-44335 E-44336
- E-44369 E-44383 E-44503 E-44508 E-44511 E-44552 E-44748
- E-44764 F-42883 F-42891 F-42897 F-43051 F-43088 F-43156
- F-43181 F-43386 F-43387 F-43472 F-43473 F-43482 F-43490
- F-43509 F-43560 F-43561 F-43562 F-43608 F-43635 F-43726
- F-43738 F-43740 F-44129 F-44222 F-44354 F-44410 F-44464
- F-44515 F-44525 F-44554 F-44567 F-44731 F-44751 F-44773
- F-44837 F-44854 F-44862 F-44941 F-44975 F-45000 J-43137
- J-43184 J-43391 J-43528 J-43631 J-43649 J-43661 J-43693
- J-43775 J-43780 J-43817 J-43896 J-44007 J-44132 J-44462
- J-44465 J-44466 J-44504 J-44506 J-44868 J-44869 J-44870
- K-42884 K-43028 K-43069 K-43323 K-43647 K-43751
- K-44523 K-44894 L-43110

J. OCEANOGRAPHY

J-42949

Gamberoni, L., comp, Charriaud, E., comp, Kartavtseff, A., comp, **MD 53/INDIGO 3/SUZAN 2 on board the Marion Dufresne Jan. 3-Feb. 27, 1987** [MD 53/INDIGO 3/SUZAN 2 á bord du *Marion Dufresne* 3 janvier-27 février 1987], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.87-04, 141p., In French. Refs. passim.

This volume is a collection of hydrological data obtained during the MD 53-INDIGO 3-SUZAN 2 expedition in the Crozet-Kerguelen-Amsterdam portion of the Indian Ocean. The volume is divided in 4 sections: CTD measurements; presentation of INDIGO 3 data; presentation of SUZAN 2 data; and hydrological observations and geostrophic flux between Kerguelen and Amsterdam Islands.

J-42951

Souchu, P., Percelay, L., Tréguer, P., **Physical and chemical characteristics of the Indian Ocean water masses south of the Polar Front (Amery Basin)** [Caractéristiques physiques et chimiques des masses d'eaux du secteur indien de l'océan austral au sud du front polaire (mer d'Amery)], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.25-41, In French.

Results of analyses of water masses carried out on board the *Marion Dufresne* during SIBEX-MD 42 are discussed and presented on tables. Data from 6 stations enable the study of water exchange between the south Indian and Weddell-Enderby basins.

J-42953

Chanut, J.P., Mayzaud, P., **Vertical structure of chlorophyll fluorescence *in vivo*** [Étude de la structure verticale de la fluorescence chlorophyllienne *in vivo*], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Feb. 1990 No.85-01, p.57-69, In French.

Variation of chemical properties, temperature, dissolved oxygen, and *in vivo* fluorescence as a function of depth was monitored at numerous stations along the antarctic continent and along parallels 64, 63, and 62S. Fluorescence profiles show maximal values at 30 and 40 m, which were recorded along parallel 64S. Results of preliminary statistical analysis of fluorescence profiles are shown in tables.

J-43010

Lu, P., Huang, F., **Distribution characteristics of chlorophyll *a* in the Great Wall Bay and its adjacent waters, South Shetland Islands, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.342-349, 24 refs.

Content and distribution of chlorophyll *a* in the Great Wall Bay and its adjacent waters were investigated from Nov., 1985 to Feb., 1986. The results obtained show that the chlorophyll *a* concentration ranged from 0.32 to 4.91 mg/cu m. The highest value (4.91 mg/cu m) occurred in Dec. with an average value of 2.47 mg/cu m. The horizontal distribution of chlorophyll *a* in surface waters is not even, and it changes with the climatic and hydrologic conditions. It should be noted that in the summer season a considerable amount of

fresh water pouring into the Great Wall Bay greatly affects the concentration and distribution of chlorophyll *a* in nearshore waters. (Auth. mod.)

J-43015

Miao, Y., Yu, H., **Survey of hydrographic structure and circulation in the waters near Wilkes Land, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.376-387, 4 refs.

Hydrographic data collected by the US icebreaker *Polar Star* off the coast of Wilkes Land during the summer of 1985 are used to analyze the vertical structure of temperature and salinity, to show distribution features of water masses and circulation, and to sketch the topography of the area surveyed. (Auth. mod.)

J-43016

Yang, T., Zhao, J., Xu, J., **Water masses and circulation around the Shetland Islands in summer**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.387-397, 15 refs.

Using the hydrographic data obtained by the R/V *Xiangyanghong 10* in summer 1984/1985, the paper discusses in detail the water masses and circulation in the Bellingshausen Sea and the Bransfield Strait and probes into the characteristics of the circumpolar deep water in the northwest part of the Bransfield Strait, the deep and bottom waters of the central Strait area, as well as the continental shelf water in the southern area, from the viewpoint of physical oceanography.

J-43017

Wang, Y., Dong, H., Xu, H., **Study on chemical characteristics of seawater in the Bransfield Strait and its contiguous oceanic areas, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.398-406, 11 refs.

Data obtained during the 1st Chinese expedition in the southern ocean are discussed. Results show a high nutrient content in the off-shore area of the Antarctic Peninsula, which gradually decreases in the Bransfield Strait waters. The contents of PO₄-P and NO₃-N show a special distribution regularity. A spring layer emerges in the vertical distribution of nutrients. Beginning from the spring layer, the regeneration of nutrients extends to the bottom in the continental shelf area; in the open sea, it can stretch to a depth of 500 m. A maximum value of content of PO₄-P and NO₃-N appears at 30 m or so, along with a minimum value of dissolved oxygen content. In addition, the vertical distributional structure of sea water is clearly shown in the curve figure of T-O₂ and AOU-P, demonstrating the typical depth and chemical characteristics of different water masses. Various factors affecting distribution of chemical elements, the formation of different water masses, and the cause of disparity of chemical elements distribution are discussed. (Auth. mod.)

J-43018

Xia, W., Zhang, H., Cheng, X., Zheng, B., **Observation of fluoride in western antarctic ocean: an unconservative element**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.406-410, 5 refs.

Data obtained during the 1st Chinese expedition in the western antarctic ocean in summer 1984-1985 are discussed and shown in tables. These include concentration and distribution of fluoride in water masses, and possible forms of fluorine in sea water, such as those originated by volcanic activity and from biological sources.

J-43133

Wefer, G., Fischer, G., Fütterer, D.K., Gersonde, R., Honjo, S., Ostermann, D., **Particle sedimentation and productivity in antarctic waters of the Atlantic sector**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.363-379, 46 refs.

DLC QE350.6.N38 1988

From 1983 to 1988 time-series traps were deployed at three sites in the Bransfield Strait and Weddell Sea to clarify the origin and mode of vertical transport of settling particles and to measure the flux. At all sites great seasonality in annual flux and composition was observed. In the Bransfield Strait, up to 97% of the total flux settled during 2 months. The annual flux to 494 m of water depth was more than 60 g/sq m and comparable to other near-shore, high-productivity areas. In the Northern Weddell Sea, the annual particle flux measured had the smallest value yet observed in the world ocean, 0.37 mg/sq m. West of Maud Rise, seasonal variability in the daily flux was less pronounced than at the other sites due to lateral transport. The annual total flux was around 10 g/sq m. The organic carbon and the biogenic opal fluxes give some indications of the level of primary production in the surface waters. (Auth. mod.)

J-43134

Fütterer, D.K., Melles, M., **Sediment patterns in the southern Weddell Sea: Filchner Shelf and Filchner Depression**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.381-401, 36 refs.

DLC QE350.6.N38 1988

Sediment patterns derived from facies distribution of surface sediments and acoustic sediment characteristics were mapped in the southern Weddell Sea between 35W and the Antarctic Peninsula at 61W. Sediment sampling with box grab and gravity corer, and 3.5 kHz sub-bottom profiling, has been carried out in recent years during several expeditions by R.V. *Polarstern* in 1984-1985. Results from sub-bottom profiling of the Filchner Shelf show a thin veneer of acoustically transparent 'postglacial' sediments overlying a hard reflector that allows no acoustic penetration into the deeper layers beneath. This reflects the transition from an overcompacted diamicton deposited by a grounded ice-sheet to glaciomarine conditions of a floating ice-shelf. Sediment textures on the shelf show a wide diversity from very well-sorted pure sands in the SE near Gould Bay, sandy muds to the west and gravelly dropstone-rich muds in the Ronne Trough closer to the foot of the Antarctic Peninsula. Surface sediments of the Filchner Depression have been subdivided into five distinct sediment types which can be related to different depositional environments. Sediment facies distribution above the overcompacted diamicton supplies information about the retreat and fluctuations of the Holocene ice-shelf edge. The continental slope north of the Filchner Depression shows a gravel-paved, acoustically hard sea bottom. This together with oceanographic data indicates an area of strong bottom water flow across the slope (northward flowing Ice-Shelf Water, ISW) which leads to vigorous erosion and lag sediment formation. (Auth.)

J-43135

Charles, C.D., Fairbanks, R.G., **Glacial to interglacial changes in the isotopic gradients of southern ocean surface water**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.519-538, 40 refs.

DLC QE350.6.N38 1988

The Atlantic sector of the southern ocean is a region characterized by intense horizontal gradients in surface water properties, including the stable isotopic content. These gradients are climatically sensitive and can be exploited for paleoceanographic purposes, provided there is a means of recording their variability. Here it is shown that core top values of $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ in the planktonic foraminiferal species *Neogloboquadrina pachyderma* follow those expected for calcite precipitated in equilibrium with surface waters. Highest values are recorded near the present Antarctic Polar Front (APF), where gas exchange rates are the highest; lower values occur both in the Weddell Gyre and near the Subtropical Convergence. Thus, the isotopic composition of *N. pachyderma* from Quaternary sediments may serve as an effective tracer of the paleochemistry of southern ocean surface waters. The $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ of glacial-age *N. pachyderma* recovered from a transect of South Atlantic cores provide a dynamic contrast to the present surface stable isotopic distribution. While the latitudinal $\delta^{18}\text{O}$ gradient in glacial *N. pachyderma* is virtually the same as the recent, $\delta^{13}\text{C}$ values from cores both north and south of the present APF are reduced by an average of 0.8 per mill. The strong sub-antarctic isotopic gradients complicate generalized interpretations of the glacial circulation, because even slight frontal movements can have a significant effect on foraminiferal isotopic values. By the same token, however, the *N. pachyderma* isotopic anomalies may be among the most quantitative and reliable measures of southern ocean frontal shifts. (Auth. mod.)

J-43136

Grobe, H., Mackensen, A., Hubberten, H.W., Spiess, V., Fütterer, D.K., **Stable isotope record and Late Quaternary sedimentation rates at the antarctic continental margin**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.539-572, Refs. p.557-560.

DLC QE350.6.N38 1988

Four cores from the antarctic continental margin, located between 50 and 200 km from the present-day ice-shelf edge, were selected for sedimentological and mass spectrometer analyses. The first stable isotope records of the southern polar ocean can be correlated in detail with global isotope stratigraphy. Together with magnetostratigraphic sedimentological and micropaleontological data, the record provides stratigraphic and paleoceanographic information back to the Jaramillo Subchron (910 ka). Oxygen isotope data give indications for a meltwater spike at the beginning of interglacials, when large scale melting of parts of the ice-shelves took place. The synchronous record of the benthic and planktonic $\delta^{13}\text{C}$ signals reflect continuous bottom water formation also during glacials. Primary productivity was strictly reduced during glacials due to continuous ice coverage in the Weddell Sea. The climatic improvement at the beginning of an interglacial is associated with peak values in biologic activity lasting for about 15 kyr. During one climatic cycle, mean sedimentation rates at the continental margin decrease with increasing distance from the continent from 5.2 to 1.3 cm/kyr. Maximum sedimentation rates of 25 cm/kyr at the beginning of an interglacial and minimum sedimentation rates of 0.6 cm/kyr during glacial periods have been calculated. These rates are mainly controlled by movements of the ice-shelf edge and ice-rafting. (Auth. mod.)

J-43137

Hodell, D.A., Ciesielski, P.F., **Southern ocean response to the intensification of Northern Hemisphere glaciation at 2.4 Ma**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.707-728, 38 refs.

DLC QE350.6.N38 1988

The changes observed across the Gauss/Matuyama boundary in Site 704 suggest that the southern ocean responded to intensified Northern Hemisphere glaciation in the following ways: surface waters cooled and the PFZ migrated north; upwelling and biological productivity increased; ice-sheets expanded on Antarctica and increased delivery of marine ice rafted detritus; and the ventilation rate of southern ocean deep water was reduced. To an approximation of 100,000 yrs, climatic and oceanographic changes appear to have been synchronous between the North Atlantic and southern ocean across the Gauss/Matuyama boundary. Further work is required to determine if interhemispheric leads or lags occurred at finer time scales. It is speculated that sea-level lowering, suppression of Northern Component Water, and decreasing atmospheric CO₂ provided strong positive feedback and a mechanism for interhemispheric coupling of the polar oceans during the climatic transition of the late Pliocene. (Auth. mod.)

J-43138

Abelmann, A., Gersonde, R., Spiess, V., **Pliocene-Pleistocene paleoceanography in the Weddell Sea: siliceous microfossil evidence**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.729-759, Refs. p.752-759.

DLC QE350.6.N38 1988

Abundance patterns of siliceous microfossils, species composition of the preserved assemblages, and time-geographic occurrences of hiatuses indicate distinct changes in paleoproductivity, surface water temperature, and deep water activity. Lower Pliocene sediments are characterized by high biogenic silica production which can be related to widespread upwelling processes in the Weddell Sea. The occurrence of warm water-related microfossils indicates latitudinal gradients less developed than those of today and a climatic optimum at around 4.8 to 4.4 Ma. After cooling, steepening of latitudinal gradients and the formation of oceanic frontal systems acting as biogeographic barriers during the late early Pliocene, and the occurrence of widespread disconformities, indicate drastic changes in ocean circulation patterns. Coinciding with the onset of major glaciation in the Northern Hemisphere around 2.6-2.4 Ma, uppermost Pliocene species compositions argue for the establishment of environmental conditions close to late Pleistocene glacial intervals, characterized by widespread occurrence of sea ice. The distinct change in facies (drop in biosiliceous and onset of calcareous accumulation) and the occurrence of 'shallow' disconformities are interpreted to indicate increased injection of relatively young North Atlantic Deep Water (NADW) into the Circumpolar Deep Water (CDW). The early Pleistocene (about 1.6-0.7 Ma) is characterized by relatively stable and warmer conditions compared to the latest Pliocene and the late Pleistocene, which are typified by cooling, distinct climatic cyclicity, and widespread occurrence of sea ice. (Auth.)

J-43139

Westall, F., Fenner, J., **Polar front fluctuations and the Upper Gauss to Brunhes paleoceanographic record in the southeast Atlantic Ocean**, NATO Advanced Research Workshop on Geological History of the Polar Oceans: Arctic versus Antarctic, Bremen, Oct. 1988. Proceedings, edited by U. Bleil, and J. Thiede, Dordrecht, The Netherlands, Kluwer Academic Publishers, 1990, p.761-782, 33 refs.

DLC QE350.6.N38 1988

Sedimentological and micropalaeontological analyses were used to trace the movements of the southern and northern limits of subantarctic belt of biosiliceous sediments in the SE Atlantic over the last 3 Myr. For this study, two cores from south of the Polar Front Zone (PFZ), PS 1448 and PS 1225, and one core north of it, ODP Hole 704B, were selected because of their relatively continuous upper Pliocene-Quaternary sediment record (dated by paleomagnetism and siliceous microfossils). The Gauss-early Matuyama period was characterized by a relatively broad belt of biosiliceous sediments and a southerly located PFZ. A major migration of the PFZ towards the north took place in the Matuyama at 1.63 Ma, during which time the sediments at Site 704B show that this site remained predominantly beneath the PFZ. In the latest Matuyama (at about 1.0 Ma) there was a major southward retreat of the northern boundary. This was followed by a northward shift in the northern PFZ boundary in the early Brunhes. Strong migrations of the PFZ characterized the middle Brunhes to Recent period. (Auth.)

J-43171

Wei, W., **Latitudinal thermal gradient of the middle Eocene/Oligocene South Atlantic Ocean: calcareous nanoplankton evidence**, *Antarctic journal of the United States*, 1989 24(5), p.110-112, 6 refs.

Quantitative analyses of calcareous nanoplankton from eight Deep-Sea Drilling Project/Ocean Drilling Project sites, ranging from the equatorial zone to 65S latitude in the South Atlantic Ocean, indicate that relatively steep latitudinal biogeographic gradients had been established at least by the middle Eocene. This contradicts the widely accepted inference from oxygen isotopic data that thermal gradients between middle and high latitudes are low or nearly flat for the Paleogene oceans. Lower surface water salinities in the high latitudes may have lowered the isotopic oxygen-18 values of the planktonic microfossils but apparently did not affect the distribution of the calcareous nanoplankton, which offers an independent means for estimating latitudinal thermal gradients.

J-43172

Domack, E.W., Burkley, L.A., Williams, C.R., **Character of modern glacial marine sediments: Antarctic Peninsula and South Shetland Islands**, *Antarctic journal of the United States*, 1989 24(5), p.113-115, 6 refs.

Surface sediments were collected from bays and fjords along the Antarctic Peninsula during USAP-88 cruise III of the R/V *Polar Duke*. Compositional and textural analyses of these sediments have been undertaken to define modern processes and the controls upon deposition. The exceptional sampling density allows for quantitative analyses of variables which include water depth, distance from source (for example the glacier terminus), ice drainage area, and bay geometry. Water-column studies are also being conducted to understand better the mechanisms of sediment transport.

J-43174

Lawver, L.A., Villinger, H., **North Bransfield Basin: R/V *Polar Duke* cruise PD VI-88**, *Antarctic journal of the United States*, 1989 24(5), p.117-120, 3 refs.

During May, 1988 R/V *Polar Duke* collected a total of 2,480 nautical miles of digitally recorded single-channel seismic data in the

vicinity of the northern Antarctic Peninsula. In addition, 17 cores were taken, primarily for thermal conductivity measurements. It had been planned to investigate both the Powell Basin immediately to the east of the tip of the peninsula, and the King George Basin of Bransfield Strait. Unfortunately, multi-year ice coverage of both locations precluded working in the Powell Basin at all and allowed only coring and a very limited seismic survey in the King George Basin. Instead of the planned work, the opportunity was taken to investigate the North Bransfield Basin and to complete a survey of the Hero Fracture Zone that had been begun on a cruise aboard R/V *Polar Duke* in Apr. 1987. A brief report provides an interpretation of the seismic results obtained over the duration of the cruise, and a sample of the seismic lines is included.

J-43182

Dunbar, R.B., Pyne, A., **Current velocities and sedimentation patterns in Granite Harbor fjord, northern Victoria Land, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.136-139, 4 refs.

As part of a cooperative U.S.-New Zealand investigation of sedimentation within Victoria Land fjords, water circulation within the inner deep basin of Granite Harbor was studied between early Nov., 1988, and early Jan., 1989. Specific objectives were to assess the efficacy of marine currents in winnowing and transporting fjord sediments, and to examine the influence of a large ice tongue on deep circulation. The overall goal is to combine results from sediment trapping, current measurements, and surface sediment analysis to construct a comprehensive view of sedimentary dynamics in a very high latitude polar fjord. Reported here are the results of short-term and long-term current measurements during the 1988-1989 field season.

J-43184

Bullister, J.L., **Dissolved chlorofluorocarbon studies in the Weddell Sea**, *Antarctic journal of the United States*, 1989 24(5), p.142-143, 4 refs.

Measurements of atmospheric and dissolved chlorofluorocarbons (CFCs) were made in the Weddell Sea as part of the ANT V/4 expedition on the West German research vessel *Polarstern*. Detailed water column profiles of the concentrations of two dissolved CFCs, CCl₃F (F-11) and CCl₂F₂ (F-12), were obtained along a section crossing the Weddell Gyre and at stations along the southern margin of the Weddell Sea in the region near the Filchner Ice Shelf. Detectable levels of these anthropogenic compounds were present in all seawater samples analyzed during this expedition. The observed distributions of these dissolved CFCs can be used to study the exchange of atmospheric gases with the ocean, and the rates and pathways by which dense surface waters in this region are mixed into the interior of the ocean.

J-43187

Muench, R.D., Gunn, J.T., Husby, D.M., **AMERIEZ 1988: Mid-winter physical oceanographic observations in the Scotia Sea**, *Antarctic journal of the United States*, 1989 24(5), p.148-150, 3 refs.

As part of the Antarctic Marine Ecosystem Research at the Ice-Edge Zone (AMERIEZ) program, water-column temperature, salinity and surface Lagrangian water-movement measurements were obtained in the Scotia Sea during austral winter 1988. The study was carried out from the R/V *Polar Duke* during two separate cruise legs from June through Aug. The first leg focussed upon processes within the multi-year pack, while the second leg focussed upon water-column processes seaward of the marginal ice zone. The Scotia Front was identifiable in winter 1988 as a region of strong temperature gradients, at depths of 300-500 m, between the water of the Weddell-Scotia Confluence Zone and warmer Pacific Deep Water. Data showed salinity (hence, density) stratification within the confluence to be similar to that farther north and south, suggesting that deep winter convection is not a significant regional process. In addition to the

Weddell-Scotia frontal system, whose presence and structure are controlled by regional oceanographic conditions, a small number of localized upper layer fronts and lenses were associated with the marginal ice zone.

J-43188

Gordon, L.I., Nelson, D.M., **AMERIEZ 1988: Nutrient distributions and variability along the Weddell-Scotia confluence and marginal ice zone during austral winter**, *Antarctic journal of the United States*, 1989 24(5), p.150-152, 10 refs.

During the 1988 Antarctic Marine Ecosystem Research at the Ice-Edge Zone (AMERIEZ) field program, nutrient distributions were measured along several north-south sections through the ice-edge region of the Scotia Sea. Preliminary examination of the data indicates that hydrographic processes primarily controlled the nutrient distributions. Biological effects were evident but appeared to control the distributions to a lesser extent.

J-43197

Rau, G.H., **AMERIEZ 1986: Carbon-13 and nitrogen-15 natural abundances in southern ocean biota collected during AMERIEZ 1986**, *Antarctic journal of the United States*, 1989 24(5), p.168-169, 9 refs.

This project is investigating stable isotope natural abundances in the context of biogeochemistry and animal trophic relationships in and near the Weddell Sea. A very significant positive correlation between particulate organic material carbon-13/carbon-12 and water temperature argues that temperature strongly influences the particulate organic material isotope abundances in this region. With regard to particulate organic material nitrogen-15 abundances, it would appear that ammonium is an important nitrogen source for particulate nitrogen formation in this region.

J-43198

Karl, D.M., **Petroleum degradation by microorganisms: Initial results from the Bahia Paraíso oil spill**, *Antarctic journal of the United States*, 1989 24(5), p.170-172, 3 refs.

To evaluate the acute and chronic effects of *Bahia Paraíso* oil on the resident microbial communities, several different experiments were performed. These were designed to provide estimates of hydrocarbon biodegradation rates at low *in situ* temperatures, to establish the biological and environmental constraints which may be unique to the antarctic marine and intertidal habitats, and to add to the oil spill modeling database. Initial results indicate that the *Bahia Paraíso* oil spill had no detrimental impact on the microbial communities in Arthur Harbor. This is probably a combined result of limited exposure of the sediment communities to the released oil, and to the microbiologically benign characteristics of the *Bahia Paraíso* OFA, a blend of diesel and jet fuel, which might be expected to behave differently from the more well-studied and more recalcitrant and toxic crude-oil components.

J-43217

Biggs, D.C., **Cooperative study of upper ocean particulate fluxes during Ocean Drilling Program Leg 119 to Prydz Bay**, *Antarctic journal of the United States*, 1989 24(5), p.193, 3 refs. For Leg 113 see 17J-39767 and 40091.

To continue and extend investigations of fluxes of natural particulate materials from southern ocean summer surface waters begun in 1987 during Ocean Drilling Program leg 113, drifting sediment traps were deployed on 11 occasions for 20-37 hours each during Ocean Drilling Program leg 119 in Jan. and Feb. 1988. Following the same analytical protocols used to process the Ocean Drilling Program leg 113 samples from austral summer 1987, researchers from several institutions are sharing splits of the trapped material to characterize its

organic carbon, organic nitrogen, amino acid, and carbon-13/nitrogen-15 composition, and chlorophylls and their degradation products.

J-43294

Odamaki, M., Oka, K., **Tides and tidal currents in the antarctic sea observed at Syowa Station, East Antarctica**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.100-107, 7 refs.

Tidal currents were observed at the Kita-no-seto Strait near Showa Station for 15 days from Jan. to Feb., 1982 by JARE-23. The observed currents show a semidiurnal type in contrast with the tides at Showa Station showing a mixed type. Judging from the amplitude and phase lag distributions around Antarctica, M2 tidal wave is understood as a standing wave which has a node near the Station. Therefore, the disagreement of the characteristics is interpreted to mean that the vertical oscillation (tide) is reduced and the horizontal movement (tidal current) becomes significant around the node. The K1 tidal wave is understood as a progressive wave which is trapped by the antarctic coast and travels from east to west once a day around Antarctica. This agrees with the fact that the phase lag of K1 tidal current at the Strait is close to that of K1 tide at Showa Station. (Auth.)

J-43309

Lenihan, H.S., Oliver, J.S., Oakden, J.M., Stephenson, M.D., **Intense and localized benthic marine pollution around McMurdo Station, Antarctica**, *Marine pollution bulletin*, Sep. 1990 21(9), p.422-430, 32 refs.

Benthic sediments and animals are being highly modified by human activities at McMurdo Station, the largest human settlement in Antarctica. The quantity of anthropogenic debris, contamination of marine sediments with hydrocarbons and metals, and gross changes in benthic communities are largely confined to Winter Quarters Bay, adjacent to the former dump site and the ice dock used by visiting ships. Levels of purgeable hydrocarbons in bay sediments are as high as 4500 ppm. There are significant negative correlations between the total number of infauna or epifauna and the concentrations of hydrocarbons and most metals in sediments. The few animals living in the back bay are motile polychaete worms with opportunistic life histories, primarily *Capitella capitata antarcticum* and *Ophryotrocha claparedii*. Fortunately, the local physical setting apparently permits little transport of contaminated sediments from the bay, but there are observable ecological impacts outside the bay along the front of the station. (Auth. mod.)

J-43310

Weber, R.R., Bicego, M.C., **Petroleum aromatic hydrocarbons in surface waters around Elephant Island, Antarctic Peninsula**, *Marine pollution bulletin*, Sep. 1990 21(9), p.448-449, 6 refs.

Results of a survey of aromatic hydrocarbons, carried out in the surface waters around Elephant I. in summer 1987 during the 5th Brazilian Antarctic Cruise of R.V. *Prof. W. Besnard*, show the following: all samples, with one exception, present levels below 1 microgram/1, which means no petroleum pollution according to criteria of Law (1981) and Marchand (1980).

J-43349

Bagriantsev, N.V., Danilov, A.I., **Investigations in the antarctic zone of the southern ocean** [Perspektivy issledovaniĭ antarkticheskoi zony IUzhnogo okeana], *Sovetskaia antarkticheskaiia ekspeditsiia. Trudy*, 1990 Vol.86, p.152-164, In Russian. 6 refs.

It is noted that the current flow on the eastern border of the southern ocean circulation in the antarctic zone depends on the extent

of topographic obstructions of the circulation in the West. Water temperature and current velocity measurements by 3 oceanographic buoys are presented on graphs. Current velocity distribution at different depths, and its temporal variations, are considered. Also discussed is the process of heat transfer in subpolar regions.

J-43365

Muench, R.D., Gunn, J.T., Husby, D.M., **Weddell-Scotia confluence in midwinter**, *Journal of geophysical research*, Oct. 15, 1990 95(C10), p.18,177-18,190, 20 refs.

The southern central Scotia Sea was sampled during June-Aug. 1988 with respect to temperature and salinity. Both drogued and ice-mounted drifters, tracked by Argos, were deployed in the region and yielded Lagrangian drift tracks of ice and water motion. The data substantiate past accounts of the region as dominated by eastward flow upon which a complex array of mesoscale features is superimposed. Weddell-Scotia Confluence Water was not detected, and the Scotia Front was not well defined. The region was one of intense mixing activity and primarily anticyclonic mesoscale features. Two such features, one an eddy and the other either an eddy or a meander in the Scotia Front, dominated the mesoscale field. Several smaller eddies, primarily anticyclonic and some having warm cores, were also detected. There was no evidence of deep convective mixing, and vigorous vertical mixing was limited to a 100 m-deep upper mixed layer. Vertical stability in the upper layers was enhanced by low-salinity water derived from melting ice. Temperature-salinity analyses show that winter water in the study region can be derived through isopycnal mixing between waters from the Scotia Sea and waters from the north-western Weddell Sea. (Auth. mod.)

J-43385

Han, Y.J., **Modelling and simulation of the general circulation of the ocean**, NATO Advanced Study Institute on Physically-Based Modelling and Simulation of Climate and Climate Change, Part 1. Proceedings, edited by M.E. Schlesinger, Dordrecht, Kluwer Academic Publishers, 1988, p.465-508, Refs. p.505-508.

DLC QC980.N37 1986 pt.1

The formulation and testing of an ocean general circulation model is described in this chapter, and is illustrated with a baroclinic six-layer global ocean model. This model has been tested by simulating the seasonal cycle of the oceanic general circulation, subject to prescribed atmospheric boundary conditions comprised of the climatological surface wind stress and atmosphere-ocean heat flux. In comparison with observations, the model has realistically simulated the large-scale features of the annual mean and seasonal variation of temperature and currents. The horizontal domain of the Oregon State University model used in this study extends from 72S to 74N and excludes the Arctic Ocean. The northern boundary of the model ocean follows the edge of the continental shelf of the composite landmass of the Americas, Europe, Africa, and Asia; the southern boundary approximately follows the edge of the continental shelf of Antarctica. Australia, New Zealand, and Antarctica itself are treated as islands. (Auth. mod.)

J-43391

Francis, P.E., Stratton, R.A., **Some experiments to investigate the assimilation of SEASAT altimeter wave height data into a global wave model**, *Royal Meteorological Society, London. Quarterly journal*, July 1990 116B(495), p.1225-1251, 25 refs.

Control experiments are described in which a wave model was run with two sets of winds, one with SEASAT scatterometer wind data included in the NWP analysis and the other without, both for a period from 0000 GMT Sep. 15, 1978 to 0000 GMT Sep. 20, 1978. The results of forcing the wave model with these wind fields are compared with the altimeter wave heights. The differences are discussed in

order to quantify errors in both the wave model and the altimetric data. Three experiments in which altimeter wave heights were assimilated are then described. The results of these are compared with the wave fields from the model runs without wave data assimilation. The assimilation experiments show that a significant improvement in model wave height is possible, and that the impact of one day of assimilation is retained for at least five days. One of the zones of emphasis in developing the model included the subantarctic ocean areas between 40S and 60S. (Auth. mod.)

J-43414

Domack, E.W., Williams, C.R., **Fine structure and suspended sediment transport in three antarctic fjords**, *American Geophysical Union. Antarctic research series*, 1990 Vol.50, Contributions to antarctic research 1, edited by C.R. Bentley, p.71-89, 33 refs.

Measurements in the ice proximal (less than 1 km) environment of 3 fjords of the Antarctic Peninsula show unique characteristics of salinity, temperature, and light transmissivity versus depth. Fine-scale layering (5 to 25 m thick) occurs as relatively cold and turbid water alternates with relatively warm and clear water. The cold turbid waters are neutrally buoyant with respect to the ambient water, and are best developed close to glacier termini, at depths of between 100 and 400 m. The data are interpreted as an indication of horizontally flattened tongues or plumes which are generated by tidal-driven circulation, cooling, and ice melting within subglacial marine cavities. Tidal flushing of near-surface crevasses also adds to the complexity of circulation. Significant quantities of suspended sediment (concentrations of up to 7 mg/l) are transported by the horizontal layers into open bays or outer reaches of the fjord system. This represents a new mechanism for the transport of sediment within fjord environments, one which may be characteristic of polar settings. (Auth. mod.)

J-43449

Fujio, S., Imasato, N., **Diagnostic calculation for circulation and water mass movement in the deep Pacific**, *Journal of geophysical research*, Jan. 15, 1991 96(C1), p.759-774, 38 refs.

The steady circulation of the deep Pacific is estimated with a robust diagnostic model, which is internally constrained by hydrographic data. It is shown that the input data should be modified to fit the model in inverse proportion to the Coriolis parameter because a density field inconsistent with the model generates unrealistic geostrophic flows. The model reproduces most of the deep currents previously reported. In addition, as a new feature, the present model diagnoses an anticyclonic circulation around the East Pacific Rise. Tracking of many particles in the diagnosed velocity field reveals that two water masses enter the Southwest Pacific Basin. One is the deep water of the South Indian Basin which enters through a gap to the south of New Zealand. The other is the upper water of the Antarctic Circumpolar Current; this water becomes dense near the Ross Sea and sinks into the deep Southeastern Pacific Basin. These waters supply comparable volumes to the Southwest Pacific Basin; the residence time is estimated to be 86 years. (Auth. mod.)

J-43483

Cripps, G.C., **Extraction and analysis of hydrocarbons in marine samples**, Cambridge, British Antarctic Survey, 1989, 13p., 17 refs.

Recently concern over sea water pollution has been increasing. In the Antarctic there is a requirement to detect levels of anthropogenic compounds which are very low relative to the natural background, hence the publication of a detailed methodology. This manual describes in detail procedures used in the antarctic program to evaluate aliphatic and aromatic hydrocarbons. The analytical

scheme discussed in this paper was successfully applied to seawater, sediments, particulates and zooplankton from the Antarctic. (Auth. mod.)

J-43485

Schlosser, P., Kromer, B., Bayer, R., Münnich, K.O., **C-14 profiles in the central Weddell Sea, Radiocarbon**, 1989 31(3), p.544-556, 39 refs.

C-14 data from stations in the central Weddell Sea are presented and discussed using additional parameters (potential temperature, salinity and He-3). The low C-14 concentrations of the surface water (approx. -90 per mill) are explained by suppressed gas exchange due to ice cover during the winter and rapid turnover of the surface layer caused by entrainment of Warm Deep Water (WDW) with low C-14 concentrations. A simple time-dependent balance calculated for the Surface Water (SW) and the underlying Winter Water (WW) can reproduce the C-14 concentrations observed in these layers for 1985. The pre-bomb C-14 concentrations are estimated at approx. -130 per mill for SW and -140 per mill for WW. A strong deviation of the SW C-14 concentration observed in 1973 from the calculated value suggests a change in surface circulation and/or air/sea exchange during the period before the Weddell Polynya in 1974. The observed C-14 concentrations of the Weddell Sea Bottom Water (WSBW; -135 to -150 per mill) are only slightly higher than those of the WDW, showing that the uptake of bomb C-14 in the Weddell Sea is limited. The C-14 profiles show a minimum at intermediate depths (approx. 1500 m) which is caused by radioactive decay and/or penetration of bomb C-14 from shallow and deep layers (WDW and WSBW) into intermediate layers. (Auth.)

J-43528

Joos, F., Sarmiento, J.L., Siegenthaler, U., **Estimates of the effect of southern ocean iron fertilization on atmospheric CO₂ concentrations**, *Nature*, Feb. 28, 1991 349(6312), p.772-775, 24 refs.

It has been suggested that fertilizing the ocean with iron might offset the continuing increase in atmospheric CO₂ by enhancing the biological uptake of carbon, thereby decreasing the surface-ocean partial pressure of CO₂ and drawing down CO₂ from the atmosphere. Using a box model, estimates are presented of the maximum possible effect of iron fertilization, assuming that iron is continuously added to the phosphate-rich waters of the southern ocean, which corresponds to 16% of the world ocean surface. After 100 years of fertilization, the atmospheric CO₂ concentration would be 59 ppm below what it would have been with no fertilization, assuming no anthropogenic CO₂ emissions, and 90-107 ppm less when anthropogenic emissions are included in the calculation. Such a large uptake of CO₂ is unlikely to be achieved in practice, owing to a variety of constraints that require further study; the effect of iron fertilization on the ecology of the southern ocean also remains to be evaluated. Thus, the most effective and reliable strategy for reducing future increases in atmospheric CO₂ continues to be control of anthropogenic emissions. The structure of the model is shown in a diagram in which a key process features the thorough mixing of interior oceans by high latitude waters. (Auth. mod.)

J-43604

Pople, A., Simpson, R.D., Cairns, S.C., **Incident of southern ocean oil pollution: effects of a spillage of diesel fuel on the rocky shore of Macquarie Island (sub-Antarctic)**, *Australian journal of marine and freshwater research*, 1990 41(5), p.603-620, 23 refs.

On Dec. 3, 1987, the Australian resupply ship *Nella Dan* ran aground at Macquarie I., releasing approximately 270,000 L of oil, mostly light diesel, into the sea. This represented one of the few spills to have occurred in Southern Hemisphere cold waters. Following

the spill, thousands of marine invertebrates were washed up dead on beaches along 2 km of the shore. Twelve months after the spill, a study was conducted to examine the shore community in 5 zones at 2 oil-affected and 2 control locations. Three sites were examined within each of these locations. Densities of marine invertebrates appeared to have been markedly reduced in the lower littoral and sublittoral zones in the vicinity of the wreck. In the upper littoral zones, algal cover and invertebrate abundance were similar at oil-affected and control locations. The significance of the spill and its long-term effects are discussed. (Auth.)

J-43629

Botnikov, V.N., **Structure of the southern ocean water masses in the Russkaya Station area** [Struktura vodnykh mass IUzhnogo okeana v raione stantsii Russkoï], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1988 Vol.83, p.87-89, In Russian.

From data on temperature, salinity and dissolved oxygen content obtained at six hydrological stations in the vicinity of Russkaya Station, three types of water masses are identified: antarctic surface water, deep circumpolar and antarctic bottom water.

J-43630

Botnikov, V.N., **Antarctic Polar Front at 20E** [Antarkticheskii poliarnii front na 20 v.d.], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1988 Vol.83, p.90-95, In Russian. 6 refs.

The structure and variations of the geographic position of the Antarctic Convergence at longitude 20E, based on 30 profiles of water temperature and salinity obtained between 1936 and 1980, were determined. The extreme southern position occurs in Mar.-Apr., the extreme northern position, in Oct.; the amplitude of seasonal latitudinal deviation of the Polar Front is 100 miles, and that of several years standing, 240 miles.

J-43631

Romantsov, V.A., **Results of marine investigations of the 26th Soviet Antarctic Expedition (POLEKS-IUg-81)** [Nauchnye rezul'taty morskoi ekspeditsii 26 Sovetskoi antarkticheskoi ekspeditsii (POLEKS-IUg-81)], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1988 Vol.83, p.96-110, In Russian. 8 refs.

Data obtained by POLEX South in Jan.-Mar. 1981, in the antarctic ocean south of Australia and New Zealand, on the meridional atmospheric processes and the physical properties of ocean currents influencing the heat and moisture exchange in the summer season, are discussed and shown in tables.

J-43633

Antipov, N.N., Korolev, V.K., Lesenkov, S.B., **Application of the main components method to analysis of water masses** [Primenenie metoda glavnykh komponent dlia analiza vodnykh mass], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1988 Vol.83, p.116-123, In Russian. 7 refs.

The method of main components for analysis of water masses of different origins is described and presented on diagrams. The method was tested during a cruise of the *Islas Orcadas* in Jan. 1977.

J-43634

Botnikov, V.N., Lebedev, A.A., **Interannual variability of water temperature, salinity and transport in the southern ocean at 20E** [Mezhhodovaia izmenchivost' temperatury, solenosti i raskhodov vody v IUzhnom okeane na 20 v.d.], *Sovetskaia antarkticheskaia ekspeditsiia. Trudy*, 1988 Vol.83, p.124-136, In Russian. 3 refs.

Tabulated long-term averages of water temperature and salinity, at longitude 20E and latitudes 35-70S, are presented for the period 1957-1980. The greatest changes are found in the subtropical surface water and in the antarctic intermediate waters of the Agulhas Current. The outstanding feature of the water masses in this region is the fluctuation of circulation intensity. A 10-11 year cycle is noted in the interannual variability of temperature, salinity and transport of the Agulhas Current and the ACC.

J-43649

Arnaud, P.M., comp, **Reports of the sea expedition to Saint Paul and Amsterdam Islands on board the Marion Dufresne July 3-Aug. 1, 1986** [Les rapports des campagnes à la mer aux îles Saint-Paul et Amsterdam à bord du *Marion Dufresne* du 3 juillet au 1er août 1986], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Apr. 1990 No.86-04, 131p., In French. Refs. passim. For selected papers see B-43652 through B-43656, C-43650 and J-43651.

This volume is a collection of individual reports of research carried out in the Indian Ocean, around Saint Paul and Amsterdam Islands, on board the *Marion Dufresne* in the austral winter of 1986. The introductory pages outline the general objectives of the expedition, show schedules and team composition, and offer tables with biological, hydrological and meteorological data obtained during the cruise. The individual reports cover preliminary results on the mapping of the two islands, the physical and chemical characteristics of the water masses around the islands, plankton characteristics and population measurements, and hydrological, meteorological and biological operations carried out in the crater of Saint Paul I.

J-43651

David, P., Guérin-Ancey, O., **Hydrological research. Preliminary report** [Travaux d'hydrologie. Rapport préliminaire], *Terres Australes et Antarctiques Françaises. Mission de Recherche. Rapports des campagnes à la mer*, Apr. 1990 No.86-04, p.43-76, In French.

Methods and results of hydrological studies carried out at stations surrounding Saint Paul and Amsterdam Islands are discussed. Numerous charts with profiles of water temperature, salinity, chemistry and acoustics are presented. Some of the physical and chemical parameters show that the peri-insular plateau waters of Saint Paul and Amsterdam Islands are not fundamentally different. Deep antarctic circumpolar waters contain 37.7-34.8 per mill of salinity and show temperatures of about 2 C. Surface water temperatures vary between 13.2 and 14.5 C, and salinity contents vary between 35.16 and 35.33 per mill.

J-43657

Rintoul, S.R., **South Atlantic interbasin exchange**, *Journal of geophysical research*, Feb. 15, 1991 96(C2), p.2675-2692, Refs. p.2690-2692.

Hydrographic data and inverse methods are used to estimate the exchange of mass and heat between the South Atlantic poleward of 32S and the neighboring ocean basins. The Antarctic Circumpolar Current (ACC) carries a surplus of intermediate water into the South Atlantic through Drake Passage, which is compensated by a surplus of deep and bottom water leaving the basin south of Africa.

As a result, the ACC loses 0.25×10^{15} W of heat in crossing the Atlantic. At 32S the meridional flux of heat is 0.25×10^{15} W equatorward, consistent in sign but smaller in magnitude than other recent estimates. Attempts to force the system to carry a larger heat flux across 32S led to unreasonable circulations. The meridional heat flux is carried primarily by an overturning cell in which the export of 17×10^6 cu m/s of North Atlantic Deep Water (NADW) is balanced by an equatorward return flow equally split between the surface layers, and the intermediate and bottom water. No input of warm Indian Ocean thermocline water is necessary to account for the equatorward heat flux across 32S; in fact, a large transfer of warm water from the Indian Ocean to the Atlantic is shown to be inconsistent with the present data set. Together these results demonstrate that the global thermohaline cell associated with the formation and export of NADW is closed primarily by a "cold water path," in which deep water leaving the Atlantic ultimately returns as intermediate water entering the basin through Drake Passage. (Auth.)

J-43661

St. Pierre, D.B., **On the effectiveness of the production of Antarctic Bottom Water in the Weddell and Ross Seas**, Monterey, Naval Postgraduate School, 1989, 124p., ADA-218 873, M.S. thesis. Refs. p.117-123.

The northward propagation of Antarctic Bottom Water (AABW), from its primary source in the Weddell Sea, has been documented since the early part of this century. Despite the striking similarities between the Weddell and the Ross Seas, AABW is mainly produced in the Weddell Sea. The question is posed as to why the Weddell Sea is so effective in the production of AABW as compared to the Ross Sea. Differences are determined by analyzing various physical mechanisms and forcing functions in both basins with respect to the two predominant theories of AABW formation: Foster and Carmack's shelf break process theory and Foldvik and Gammelsrod's theory of ice shelf processes. Results reveal that the strong tidal forcing at the Weddell Sea ice shelf barrier combines with the wind stress field and with the special under-ice-shelf and continental shelf bathymetries of the Weddell Sea to become the critical elements of the AABW formation process. The shelf process theory is found to account for the formation of Weddell Sea Bottom Water (WSBW), the parent constituent of AABW. (Auth. mod.)

J-43692

Lanin, V.I., **Oceanographic preconditions for the formation of heightened fish productivity of antarctic banks, U.S. Department of Commerce. Southwest Fisheries Center Honolulu Laboratory. Translation**, Jan. 1991 No.132, 13p., 13 refs. For Russian original see 15J-32656.

The formation and vertical development of topographic eddies in antarctic waters are described. In double-diffusion conditions the development of a finely structured boundary layer between the surface and deep-water masses is observed which, at breaking, causes a swift vertical development of eddies over banks, on the top surface of the boundary layer or directly below it. Water structural transformations inside the Taylor's columns generate the vertical development of the topographic eddy, creating favorable conditions for the entrapment of pelagic plankton and its transportation to the bottom. Frequent formation of Taylor's columns over some of the antarctic banks provides a stable food supply, and consequently contributes to the development of significant concentrations of deep-water fish.

J-43693

Wolff, J.O., Maier Reimer, E., Olbers, D.J., **Wind-driven flow over topography in a zonal Beta-plane channel: a quasi-geostrophic model of the Antarctic Circumpolar Current**, *Journal of physical oceanography*, Feb. 1991 21(2), p.236-264, 39 refs.

Experiments with this model address the problem of the relative role of transient and standing eddies, as well as bottom friction and topographic form stress, in the balance of a current driven by a steady surface windstress. The response of the system is investigated for different values of the friction parameter and various locations of topographic obstacles in the bottom layer of the channel. The principal momentum balance emerging from these experiments supports the concept for the dynamics of the Antarctic Circumpolar Current which proposes that the momentum input by windstress is transferred to the deep ocean, in the present model by vigorous eddy activity, where it leaves the system by topographic form stress. Frictional effects in the balance of the circumpolar flow may thus be of minor importance. This concept of the momentum balance is confirmed in simulations over more complex topographies. Here the authors have taken two differently scaled versions of the highly resolved bottom relief in the Macquarie Ridge area. The flow in these simulations is virtually frictionless in the momentum balance. The flow pattern reflects some features of the Circumpolar Current in this area. (Auth.)

J-43743

Schlüter, M., **Early diagenesis of organic carbon and opal in sediments of the southern and eastern Weddell Sea. Geochemical analysis and modelling** [Zur Frühdiagenese von organischem Kohlenstoff und Opal in Sedimenten des südlichen und östlichen Weddellmeeres. Geochemische Analyse und Modellierung], *Berichte zur Polarforschung*, 1990 No.73, 156p., In German with English summary. Refs. p.117-135.

During the ANT V/4 (1986/87) and ANT VI/3 (1987/88) cruises of R.V. *Polarstern* sediments from the eastern, southern and central Weddell Sea were sampled with a boxcorer and/or a multicorer. The 24 sampling locations are distributed over the whole depth range, from shelf to pelagic environments. Porewater concentrations of aluminum, fluoride, manganese, nitrate, nitrite, oxygen and silicate, the pH and the alkalinity were measured. Of the sediment the opal, calcium carbonate and organic carbon content were quantified. The Pb-210 profile was measured for three sediment cores. This investigation deals with the estimation of the amounts of opal and organic carbon that are transported into the sediment, the regional distribution of these flux rates, and the early diagenetic processes that control the preservation of organic carbon and opal in the sediment. In the Weddell Sea the opal content at the sediment surface (0-1 cm depth) varies between 0.1 and 7%-wt. These opal concentrations are much lower than the opal contents determined for the sediments of the Ross Sea in 1986. The regional distribution of the opal content and the computed opal flux rates are correlated with the organic carbon flux rates. The processes controlling the preservation of opal are discussed based on the measured aluminum and silicate concentrations in the pore water and the opal content of the sediment. The depth distribution of the Si- and Al concentrations of the porewater indicates that the reconstitution of clay minerals takes place in the immediate vicinity of the sediment-water interface. (Auth. mod.)

J-43744

Gersonde, R., ed, Hempel, G., ed, **Expeditions ANTARKTIS VIII/3 and VIII/4 of RV *Polarstern* in 1989** [Die Expeditionen ANTARKTIS-VIII/3 und VIII/4 mit FS *Polarstern* 1989], *Berichte zur Polarforschung*, 1990 No.74, 173p., In German with English summary. 16 refs. (p.105-106).

Expedition ANT-VIII/3 focused on a marine geological program carried out in the Antarctic Polar Frontal Zone and the areas north and south of this frontal system. Samples were taken at 38 sites located on four transects in a sector between 13E and 32W. 270 m of sediment core were gathered at 33 sites using gravity, piston, or kasten corer. Holocene sedimentation rates of 10-50 cm/1000 years were found in the area of the Polar Front and in the northernmost area of the Antarctic Zone, between 49S and 55S. Sedimentation rates in

the region north of the Polar Front range on average between 1-3 cm/1000 years. Beside the collection of sediment cores a program was carried out to sample calcareous and siliceous microorganisms in the water column and at the sea floor. Samples are used for the delineation of species distribution patterns in the southern ocean in relation to hydrographic and environmental conditions such as nutrient availability, water temperature, and salinity. Geochemical investigations were carried out on bottom sediments, concentrating on early diagenetic processes of organic carbon and opal and on modeling of flux rates. Other analyses of the water column concentrated on the investigation of nutrients, biogenic and anthropogenic halogenated hydrocarbons, stable isotope composition of water masses, and the distribution of deep-sea bacteria. (Auth. mod.)

J-43763

Wang, C., Cheng, X., **Early chemical diagenesis of sulfur in Maxwell and Admiralty Bays of Antarctica**, *Oceanologia et limnologia sinica*, Sep. 1990 21(5), p.465-473, In Chinese with English summary. 2 refs.

Analysis of water and sediment samples taken from Maxwell and Admiralty Bays is discussed. The transformation regularity from SO₂ and SO₄ to sulfids, and the controlling relation between these regularities and environment factors, are also discussed based on the data of various species of sulfur compound. The influence of benthic fauna bioturbation on geochemistry of sediments and interstitial water is also studied. The results suggest that the areal characteristics of SO₂ and SO₄ reduction and transformation is significant on account of the connection between these characteristics and environmental control. (Auth. mod.)

J-43768

Capodaglio, G., Toscano, G., Scarponi, G., Cescon, P., **Lead speciation in the surface waters of the Ross Sea (Antarctica)**, *Annali di chimica*, 1989 79(11-12), p.543-559, 33 refs.

Lead complexation in the surface water of Terra Nova Bay was studied by Differential Pulse Anodic Stripping Voltammetry (DPASV). Total dissolved lead concentration ranged between 25 and 114 pM, with a homogeneous distribution in offshore waters at open ocean level. The inorganic or ASV-labile fraction was 20-50%. Data obtained was consistent with one class of organic ligands whose concentration varied between 0.3 and 0.9 nM. The mean value for the conditional stability constant was 9.7. A relation between ligand concentration and chlorophyll was observed. (Auth.)

J-43770

Loglio, G., Degli Innocenti, N., Tesei, U., Stortini, A.M., Cini, R., **Surfactant and particulate matter exchange at the air-water interface in the antarctic environment**, *Annali di chimica*, 1989 79(11-12), p.571-587, 37 refs.

The selective transport processes at the air-water interface are an important means of characterization of the marine aquatic coastal environment and can be used to evaluate some aspects of the environmental impact from a chemical physical point of view. Here are given the first results obtained from samples of antarctic seawater in 1987-88. A comparison is carried out between Tyrrhenian and antarctic seawater samples, and the conservative nature of the antarctic ecosystem is evidenced. In some cases, the behavior of the samples also suggests the presence of surfactants that could be extraneous to the antarctic ecosystem. (Auth.)

J-43771

Desideri, P., Lepri, L., Checchini, L., **Identification and determination of organic compounds in sea water in Terra Nova Bay (Antarctica)**, *Annali di chimica*, 1989 79(11-12), p.589-605, 34 refs.

Sea water and particulate samples taken from Terra Nova Bay were analyzed for the presence of organic compounds; n-paraffins, cycloalkanes, branched alkanes, benzenes, PAHs, heterocompounds, phthalates, DDTs and PCBs were found. The anthropogenic and natural origin of such compounds is discussed according to their distribution and concentration in the different matrices. (Auth.)

J-43772

Baffi, F., Soggia, F., Frache, R., Cardinale, A., **Distribution of heavy metals in the water and in suspended particulate matter in the Ross Sea (Antarctica)**, *Annali di chimica*, 1989 79(11-12), p.607-616, 18 refs.

Reported here are the first data on concentration and distribution of heavy metals in water and in suspended particulate matter in samples collected in the Terra Nova Bay during 1987/88. The methods of heavy metals determination required the use of AAS/ETA and ICP/AES, previous Chelex-100 preconcentration from water and 8 N HNO₃ treatment of particulate matter. The obtained data are compared with those of the literature. (Auth.)

J-43773

Mazzucotelli, A., Cosma, B., Soggia, F., **Trace metals distribution in antarctic sediments (Terra Nova Bay-Ross Sea) by inductively coupled plasma atomic emission spectroscopy**, *Annali di chimica*, 1989 79(11-12), p.617-628, 32 refs.

Trace metals (zinc, lead, cadmium, cobalt, manganese, chromium, copper, nickel, strontium and barium) together with some major elements (aluminum and iron) were analyzed in several samples of sediment collected in the Terra Nova Bay during 1987-88. The samples were analyzed by inductively coupled plasma (ICP-AES) after a total digestion and selective extraction procedure. International standard reference samples were also analyzed after total solubilization. Results show a good agreement with data available in the literature. Generally, the trace values are lower than those obtained in marine sediments of non-antarctic regions. (Auth. mod.)

J-43774

Mentasti, E., Porta, V., Abollino, O., Sarzanini, C., **Trace metal determination in antarctic seawater**, *Annali di chimica*, 1989 79(11-12), p.629-637, 20 refs.

The analysis of a series of trace metal ions, mainly As, Cd, Cu, Fe, Ni, Pb, Sb, Se, Zn, has been carried out in seawater samples collected from Terra Nova Bay during the Italian expedition to Antarctica in summer 1987/88. The very low concentration levels of the majority of such elements suggested the adoption of preliminary enrichment procedures combined with an atomic spectroscopic technique. The results are discussed with particular reference to the blanks of the methods developed, and with the quality of the laboratory environments in which the results reported have been obtained. (Auth.)

J-43775

Calvelli, G., Ceccato, D., Mittner, P., Schiavuta, E., **Aerosol production processes from marine waters sampled in Antarctica and multielemental characterization of the particulated matter involved**, *Annali di chimica*, 1989 79(11-12), p.639-676, 19 refs.

Particulate matter is an important component of the materials transported through the sea-air interface in marine aerosol formation processes. Processes of this type have been reproduced in the laboratory by using 11 samples of seawater collected in 1987-88. Two gas bubble extraction processes have been performed as well, the first from a seawater sample, the second from a snow water sample. Results are reported of a multielemental characterization of the particulated matter contained in all the samples, and the values of 2

parameters which significantly describe the behavior of each particular element in each particular process: enrichment and mass unbalance. The second parameter is relevant from the point of view of flocculation-deflocculation phenomena associated with the processes. (Auth.)

J-43776

Morselli, L., Zappoli, S., Donati, A., **Identification, quantification and distribution of Polychlorinated Biphenyls (PCB) in an antarctic marine environment: Terra Nova Bay, Ross Sea, *Annali di chimica*, 1989 79(11-12), p.677-688, 21 refs.**

A study is presented on the presence of polychlorinated biphenyls (PCB) in Terra Nova Bay. The research is part of a broader research project being carried out by the Environmental Impact Group of the Italian expedition in Antarctica. The sampling was performed during Jan.-Feb. 1988. The method chosen for PCB identification allowed quantification of each detected congener, avoiding any kind of pattern recognition procedure. The recovery of the analytical method is more than 97%. A total PCB concentration ranging from 4 to 25 ng/l was observed in environmental samples. In order to find possible correlation among samples a cluster analysis technique was performed with analytical data. This data processing offers a useful data base. (Auth. mod.)

J-43777

Betti, M., Fuoco, R., Papoff, P., **Determination of trace elements in sea water samples from Terra Nova Bay, Ross Sea (Antarctica), *Annali di chimica*, 1989 79(11-12), p.689-699, 7 refs.**

The concentration of total dissolved copper, lead, cadmium and zinc has been determined by differential pulse anodic stripping voltammetry in filtered sea water samples collected in Terra Nova Bay during the Italian expedition, Dec. 1987-Feb. 1988. The samples, which were filtered and acidified in the laboratory on board the ice-breaker as soon as possible after collection, were analyzed after oxidative treatment (U.V. light irradiation under reflux for six hours after adding H₂O₂) in order to eliminate dissolved organic matter, which may directly interfere with the electrode processes, and to release bound metal ions from electroinactive complexes. Measurements were also performed without oxidative treatment for comparison. The following were the concentration ranges measured after the oxidative treatment: cadmium (21-55 ng/l); lead (35-76 ng/l); copper (123-279 ng/l) and zinc (95-475 ng/l). The relative standard deviation (*rsd*) was about 30% for all elements apart from zinc, whose *rsd* was about 50% owing to very high reagent contribution. (Auth.)

J-43779

Saini, G., Baiocchi, C., Bertolo, P., **Determination of copper, nickel and cadmium in antarctic seawater and snow, *Annali di chimica*, 1989 79(11-12), p.713-721, 18 refs.**

Copper, nickel and cadmium have been determined in seawater samples collected by the Italian expedition in 1987-88. The determinations have been performed with GFAAS on a preconcentrate obtained by reductive precipitation. Samples of snow preconcentrated by lyophilization were analyzed by means of GFAAS for Cd, Ni, Cu and Cr. The results are discussed by considering the possible sources of contamination of samples. The amount of Cd in 2 of the samples collected near the Italian station and on the coast is higher than the average content in the other samples, which could reflect an anthropogenic contamination. (Auth. mod.)

J-43780

Triulzi, C., Mangia, A., Casoli, A., Albertazzi, S., Nonnis-Marzano, F., **Artificial and natural radionuclides, alkaline and earth-alkaline elements in some environmental abiotic samples of Antarctica, *Annali di chimica*, 1989 79(11-12), p.723-733, 7 refs.**

Results are reported of chemical and radiochemical analyses carried out on marine water and sediment, and soil samples collected around the Terra Nova Bay Station during the 1986-87 and 1987-88 expeditions. Data on Cs-137, Th-232, U-238 and K-40 radionuclides are compared with those obtained from the North Atlantic region and from marine and terrestrial regions of Italy before and after the Chernobyl accident. (Auth.)

J-43815

Mordasova, N.V., **Chlorophyll distribution in the antarctic zone of the Atlantic Ocean, *Oceanology*, Dec. 1989 29(3), p.368-374, 10 refs.** For Russian original see 18J-41740.

Studies on chlorophyll in the Atlantic sector of Antarctica revealed extraordinary heterogeneity of its distribution in shelf and deep water regions, which is related to oceanological and biological factors. Generally, the areas studied can be considered as highly and moderately productive waters of the World Ocean. Maximum values of chlorophyll *a* concentration, about 1 microgram/l in surface water and more than 50 mg/sq m in the 0-100 m layer, characterize the zone of eddies and vortices near South Georgia, the mixing zones of different types of water, and the zones above underwater rises near the Shag Rocks. Continuous fluorescence measurements of chlorophyll *a* in antarctic surface waters showed that the amount of chlorophyll is, as a rule, close to its weighted average content in the upper mixed layers; the correlation coefficient is about 0.9. (Auth. mod.)

J-43817

Seidov, D.G., **Synergetics of ocean processes [Sinergetica okeanskikh protsessov], Leningrad, Gidrometeoizdat, 1989, 287p., In Russian with English summary. 258 refs.**

Presented is an analysis of self-organization of Earth's climatic system and its main part, the ocean. Synergetics, the general approach to the study of universal features of self-organization phenomena, emerges in the book as a basis for understanding the ocean processes. Structure and variability of the ocean climate on different time and space scales, the interactions between ocean eddies and between them and the large-scale currents are considered. The results of the eddy-resolving numerical modelling of the ocean circulation are carefully discussed. A phenomenological low-parametric model of the ocean circulation energetics is constructed. Antarctic glaciations, their history and their role in global climatic changes, are briefly reviewed. (Auth. mod.)

J-43825

Simoneit, B.R.T., **Hydrothermal petroleum generation from immature organic matter: implications to the oceanic carbon cycle, Facets of modern biogeochemistry: Festschrift for E.T. Dugans, edited by V. Ittekkot, S. Kempe, W. Michaelis, and A. Spitz, Berlin, Springer-Verlag, 1990, p.365-387 (Pertinent p.374-376).**

DLC QE515.F23 1990

Sediment maturation and lithification causes metamorphosis of organic matter over geological time periods, yielding petroleum products by the effects of temperature, pressure and petrology. However, the action of hydrothermal processes on such sedimentary organic matter generated petroleum-like products in Guaymas Basin essentially "instantaneously" with respect to geological time. This process and its implications is reviewed here vis-à-vis various areas where hydrothermal activity is occurring, in both sedimented and bare-rock regions. Bransfield Strait is one such area examined briefly.

J-43868

Belkin, I.M., **Hydrological fronts of the Indian Subantarctic** [Gidrologicheskie fronty Indookeanskoï Subantarktiki], *Antarktika; doklady komissii*, 1990 No.29, p.119-128, In Russian with English summary. Refs. p.126-127.

Data obtained by the Japanese Antarctic Research Expedition are used for systematic study of thermohaline fronts of the Antarctic Circumpolar Current (ACC) SE of Africa and SW of Australia. In the Crozet Plateau region, the Subtropical and Subantarctic fronts (STF and SAF) are confluent into the "United STF/SAF" at 39-43S. This confluence is caused by the bottom relief that deflects to the North the ACC jet corresponding to the SAF. The Polar Front (PF) is located northward of the Ob-Lena Rise, at 50-51S. To the SW of Australia, the triple structure (STF + SAF + PF) is restored, which is typical of the southern ocean, but the STF-SAF relation is different in the SW- and SE Indian Ocean, with TS-indices of the fronts being regionally specific. Interannual variability of the frontal positions for 1965-1983 and their relation with topography are explored. (Auth. mod.)

J-43881

Miller, K.G., Wright, J.D., Fairbanks, R.G., **Unlocking the ice house: Oligocene-Miocene oxygen isotopes, eustasy, and margin erosion**, *Journal of geophysical research*, Apr. 10, 1991 96(B4), p.6829-6848, Refs. p.6845-6848.

Oxygen isotope records and glaciomarine sediments indicate at least an intermittent presence of large continental ice sheets on Antarctica since the earliest Oligocene (c. 35 Ma). The growth and decay of ice sheets during the Oligocene to modern "ice house world" caused glacioeustatic sea level changes. The early Eocene was an ice-free "greenhouse world," but it is not clear if ice sheets existed during the middle to late Eocene "doubt house world." Benthic foraminiferal delta O-18 records place limits on the history of glaciation, suggesting the presence of ice sheets at least intermittently since the earliest Oligocene. The best indicator of ice growth is a coeval increase in global benthic and western equatorial planktonic delta O-18 records. Benthic foraminiferal delta O-18 increases which are associated with the bases of Zones Oil (c. 35.8 Ma), Oi2 (c. 32.5 Ma), and Mil (c. 23.5 Ma) can be linked with delta O-18 increases in subtropical planktonic foraminifera and with intervals of glacial sedimentation on or near Antarctica. (Auth. mod.)

J-43890

Gersonde, R., **Paleontological significance of fossil diatoms from the high-latitude oceans**, Polar marine diatoms, edited by L.K. Medlin and J. Priddle, Cambridge, UK, British Antarctic Survey, Natural Environment Research Council, 1990, p.57-63.

Depositional patterns of Cenozoic diatomaceous sediments in the high-latitude oceans have been affected by major changes in oceanographic circulation related to plate tectonic movements (e.g. opening of deep water pathways) and global climatic changes (e.g. onset of glacial regimes). The stepwise cooling in the polar regions was enhanced during the Neogene, and this resulted in progressively greater thermal differentiation between the high- and low-latitude ocean areas, leading to the establishment of biogeographic diatom provinces characterized by endemic floras. During the Neogene, in particular, the areas of the southern ocean and the Subarctic Pacific became major sinks for diatomaceous silica. Consequently, in these areas Neogene diatoms are prominent microfossils useful for biostratigraphic age assignments and reconstructions of past oceanographic and climatic conditions.

J-43891

Munk, W., **Refraction of sound waves at polar latitude**, *Journal of geophysical research*, Apr. 15, 1991 96(C4), p.7015-7022, 7 refs.

Horizontal refraction in the ocean sound channel is a function of the acoustic mode number and frequency (chromatic aberration), and may lead to wide separations of long-range transmission paths. This paper considers the 1960 antipodal transmission from Perth, Australia, to Bermuda. The path has a southernmost point in the Indian Ocean, which depends sensitively on horizontal refraction associated with the north-to-south shoaling of the sound axis across the Antarctic Circumpolar Current. (Refraction by the current velocity is relatively small.) This southernmost point is at about 40S for low modes of relatively high frequency, and at about 50S for modes of low frequency. (Auth. mod.)

J-43896

Lutsenko, E.I., **Provision of meteorological information for safe navigation in the southern ocean** [Nekotorye voprosy meteorologicheskogo obespecheniia bezopasnosti moreplavaniia v IUzhnom okeane], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.35-40, In Russian. 8 refs.

The risks of navigation in the Antarctic, especially toward the end of the fall season, such as severe storms, ship icing or collision with icebergs, etc. are discussed. To increase accuracy in weather forecasting, and provide greater safety to ships, gathering of data at the Soviet Molodezhnaya, Bellingshausen and Leningradskaya meteorological stations, including satellite information, is described. Data dissemination and services available to ships are reviewed.

J-43918

Matsuda, O., Ishikawa, S., Kawaguchi, K., **Fine-scale observation on salinity stratification in an ice hole during melting season of antarctic sea ice**, *Antarctic record*, Nov. 1990 34(3), p.357-362, 8 refs.

Observation of seasonal variations of sea water temperature and salinity was carried out through an ice hole near Showa Station as part of JARE-25. From Mar. 1984 to Jan. 1985, temperature and salinity stratification were observed in the upper layers of the water. In order to clarify the microstructure of the stratification, fine-scale observations on temperature and salinity profiles were conducted through the ice hole with the use of a CSTD monitor at depth intervals from 5 to 10 cm on Jan. 6, 1985. Results revealed that an intensified halocline occurred at depths between 120 and 150 cm, where salinity changed considerably (from 3.33 to 27.88 per mill.) This halocline supposedly occurs in the underlying sea water, immediately below the ice, and around the ice hole. Such a condition may naturally occur in the area of puddles within the thawing holes and cracks. Ice algae inhabiting the undersurface of ice may be physiologically affected by the extremely low salinity of the underlying sea water. (Auth.)

J-43930

Kotliakov, V.M., **Effect of the continental snow cover in the Southern Hemisphere on the distribution of moisture among oceans**, *Akademiia nauk SSSR. Doklady. Earth science sections*, Jan.-Feb. 1989 304(1), p.242-246, 5 refs. For Russian original see 43-4287 or 17J-40048.

Snow cover constitutes a primary reserve for surface waters, and thus it plays a crucial role in the global distribution of water between ocean basins. In this article, snow cover distribution in the Southern Hemisphere, including Antarctica, is correlated to the meteorological redistribution of its moisture via atmospheric transport to major ocean basins. The fraction of solid precipitation eventually redistributed to other oceans is less for the Southern Hemisphere than for other continents. 81% of the solid precipitation falling in the Southern Hemi-

sphere is returned to the basin of its origin via this redistribution mechanism.

J-43968

Kocmur, S., Vodopivec, C., **Continuous register of physical and chemical parameters in antarctic surface waters.**

Part 1: Weddell Sea [Registro continuo de parámetros físico-químicos superficiales en mares antárticos. Primera parte: mar de Weddell], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.372, 35p., In Spanish with English, French and German summaries. 14 refs.

During Jan. and Feb. of 1986, a continuous record of micronutrients (nitrite + nitrate; orthophosphate and silicate), luminescence attributable to chlorophyll *a*, with discrete records and schedules of salinity, temperature and pH, was carried out in surface waters of the Drake Passage, the Weddell and Bellingshausen Seas, and the Bransfield Strait. In this first communication only the records obtained in the Weddell Sea are presented. The discussion covers the importance of the melting of the sea ice at the end of Feb. in relation to the stability of the surface waters of the region, and how this affects the local biology. (Auth. mod.)

J-43972

Nazirov, M., **Icebergs as oceanographic tracers (in the example of the Weddell Sea in Antarctica)** [Айсберги как океанографические трассеры (на примере моря Уэдделла в Антарктике)], *Leningrad. Gosudarstvennyi nauchno-issledovatel'skii tsentr izucheniia prirodnikh resursov. Trudy*, 1989 Vol.33, p.142-148, In Russian. 6 refs.

Data are presented confirming that the use of drifting ice, in the capacity of freely floating tracers, helps to discover new aspects of global and regional mechanisms of hydrothermal processes, and to specify the genetic interrelationship between the local and global manifestation of those mechanisms.

J-44007

Ikeda, S., Matsumoto, K., **Oceanographic data of the 30th Japanese Antarctic Research Expedition from Nov. 1988 to Mar. 1989, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1991 No.161, 40p.

This report presents the data of oceanographic observations on board the icebreaker *Shirase* and tidal observations at Showa Station. Oceanographic observations include surface temperature measurements and surface water chemical analysis, surface current measurements, and expendable bathythermograph data. Serial observations were made at 7 stations; all the results, together with meteorological data, are presented in tables.

J-44010

Domack, E.W., **Laminated terrigenous sediments from the Antarctic Peninsula: the role of subglacial and marine processes**, Glacimarine environments: processes and sediments. Edited by J.A. Dowdeswell and J.D. Scourse. Geological Society. Special publication No.53, London, Geological Society, 1990, p.91-103, 30 refs.

Although laminites from the continental slope and rise are known from a number of regions in Antarctica, laminated muds on the continental shelf have not been widely recognized. During USAP-88 cruise III of the RV *Polar Duke*, piston cores were collected along the Danco Coast of the Antarctic Peninsula within a submarine valley which appears to extend beneath the terminus of a tidewater glacier (Cayley Glacier). The glacial regime of the area today is polar to sub-polar, with restricted ice surface melting. Fine-scale horizontal layers in the water column transport fine-grained sediment at mid-water depths. Such features are not related to surface meltwater processes,

but may be caused by tidal pumping of the basal cavity. The random bedding thickness of the sediments is related to the present depositional environment which includes iceberg rafting, bioturbation, pelagic settling of biogenic detritus, and sediment gravity flows. The rhythmic units likely represent subglacial marine deposition within the valley, possibly under the influence of tidal processes. (Auth. mod.)

J-44043

Lutjeharms, J.R.E., **Thermal structure of the southern ocean between Cape Town and Marion I.**

[Temperatuurstruktuur van die oseaanbolaag tussen Kaapstad en Marion-eiland], *South African journal of antarctic research*, 1990 20(1), p.21-32, In Afrikaans, with English summary. 40 refs.

The Prince Edward I. group is, according to altimetry and drifter information, located just to the west of an area with remarkably high surface current speeds, but low meso-scale variability. To establish what is presently known about the general oceanic environment of these islands, results of a number of cruise lines undertaken during the last ten years are discussed in detail. A summary of these results shows the location of the island group relative to the most important oceanic fronts of the general area, as well as the possible influence of meso-scale eddies with various origins on the surrounding ocean area. (Auth.)

J-44044

Ismail, H.E., **Surface nutrients in the vicinity of the Prince Edward Islands during April/May 1989, South African journal of antarctic research**, 1990 20(1), p.33-36, 16 refs.

The micro-nutrients silicate, nitrite, nitrate, phosphate, ammonia and urea were analyzed on an ongoing basis during a cruise to the Prince Edward Is., in order to provide a chemical background for the physical and biological studies undertaken concurrently. Preliminary results are presented and discussed. There were marked increases in reduced nitrogen (ammonia and urea), silicate, nitrate and phosphate in the near-shore areas of the island group compared with the surrounding open ocean. (Auth.)

J-44086

Foldvik, A., Gammelsrød, T., **Observations of ice shelf water at the southern Weddell Sea shelf break, Norsk Polarinstitutt. Meddelelser**, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.125-130, 2 refs.

In the NARE 1989/90 expedition the ice conditions were difficult, with unusually large and thick floes which could not be negotiated. This situation hampered the planned program and led to substantial modifications. The CTD work on the shelf break went well and altogether 96 CTD stations were logged. A number of these are actually current profiling stations (jo-jo stations) at a fixed locality near the bottom. About 500 water samples were obtained for chemical analysis. A section of CTD stations at the slope is shown. At the bottom of the slope there is a very cold and shallow plume of Ice Shelf Water with strong gradients towards the overlying warmer water. The minimum temperature in this plume was -2.2 °C. Simultaneous current meter measurements indicated maximum velocities of about 50 cm/s. The CTD station is located on the eastern side of a shallow submarine ridge which turns the current of Ice Shelf water towards the NNE. Here the temperature was -1.65 °C at 2200 m depth, possibly the lowest temperature ever recorded at such a great depth. Selected, superimposed CTD profiles at the shelf break show that the temperature and the salinity stay remarkably constant down to approximately 2000 m. The implication is that very little mixing is taking place in the Ice Shelf water plume down to these depths.

J-44088

Sjöholm, J., Jansen, E., **Marine geological studies in the Weddell Sea**, *Norsk Polarinstitutt. Meddelelser*, Dec. 1990 No.113, Norwegian Antarctic Research Expedition 1989/90, Report. Edited by O. Orheim, p.139-144, 2 refs.

During NARE 1989/90, geological sampling was carried out at two locations in the Deutschland Canyon area with five and four stations at each location respectively yielding 11 cores 20 to 600 cm long. The cores were recovered in slopes with water depths from 3,200 to 2,700 m. The third geological station (Crary Fan area) was not reached due to severe ice conditions. One core from the first location was opened onboard *Andenes*. The remaining cores were brought to the University of Bergen for further investigations, including sedimentological studies, chronology, and foraminiferal carbonate studies (if found). Microfossil floras and faunas (diatoms, forams, radiolaria) will be used to infer surface water paleoenvironments. The opened core showed stratified layers, probably turbidite, with some dropstones (ice-rafted material) indicating younger material (Recent). Some of the material at location 1 was very hard; the barrel could penetrate no more than 20 cm of the sediment. This might represent levee deposits closely connected with the turbidite deposits, indicating strong bottom current activity in the Deutschland Canyon area.

J-44097

Kristoffersen, Y., Hinz, K., **Evolution of the Gondwana plate boundary in the Weddell Sea area**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.225-230, 20 refs.

Multichannel seismic surveys have outlined two sets of basement structures below the East Antarctic continental margin of the Weddell Sea, between 0 and 40W. One set is formed by the Explora-Andenes Escarpment (EAE), trending N60-80W and bounded on the seaward side by oceanic crust. The other set lies landward of the EAE and represents a failed rift system trending N50E. The presence of a failed rift system (named Weddell Rift) with symmetrical volcanic wedges demonstrates that the initial motion was rifting accompanied by prolific volcanism, and that an area of oceanic crust >40 km wide may have been generated. A subsequent change in the regional stress field initiated transtensional movements between South Africa and Antarctica, resulting in the formation of the Explora-Andenes Escarpment as a new plate boundary, and the opening of the Weddell Sea by seafloor spreading. (Auth.)

J-44098

Anderson, J.B., Andrews, B.A., Bartek, L.R., Truswell, E.M., **Petrology and palynology of Weddell Sea glacial sediments: implications for subglacial geology**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.231-235, 11 refs.

Petrological analyses and examination of recycled palynomorphs were conducted on basal tills and glacial marine sediments of the eastern Weddell Sea shelf. Five petrological provinces whose boundaries parallel glacial flow lines of both the East and West Antarctic ice sheets are recognized. To some degree, the pebbles within glacial deposits of the continental shelf mimic the exposed geology of regions situated upstream (along palaeoflow lines) of these deposits. However, a proportion of pebbles, sand-sized minerals, and recycled palynomorphs suggest that sedimentary basins containing Late Jurassic-Late Cretaceous sedimentary deposits are situated beneath the East Antarctic ice sheet and on the adjacent continental shelf. These same data indicate that, during that time, a seaway extended along what is

now the eastern shelf south to approximately 75S, and that Tertiary sedimentary deposits are either absent or are of limited extent. (Auth.)

J-44099

Barker, P.F., Lonsdale, M.J., **Multichannel seismic profile across the Weddell Sea margin of the Antarctic Peninsula: regional tectonic implications**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.237-241, 33 refs.

Sediments beneath the continental slope and rise of the Weddell Sea margin of the Antarctic Peninsula are very thick. Basement (presumed oceanic) is seen only beneath the rise, where the minimum sediment thickness is 4.7 s TWT. After isostatic correction for sediment loading, basement depths clearly predict a late Mesozoic (Early Cretaceous or Late Jurassic) age for oceanic basement. Although there are no controls on sediment age, this basement age estimate and the great thickness of overlying sediment argue against the existence of an active Cenozoic plate boundary along the eastern margin of the Antarctic Peninsula, and thus against Cenozoic motion between the peninsula and East Antarctica. The age estimate also constrains models of the early evolution of the Scotia arc: east-directed subduction originated at a southward extension of the Magallanes Basin fold-thrust belt. (Auth.)

J-44106

Cooper, A.K., Davey, F.J., Behrendt, J.C., **Structural and depositional controls on Cenozoic and (?) Mesozoic strata beneath the western Ross Sea**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.279-283, 16 refs.

The western Ross Sea (WRS) is underlain by up to 14 km of mostly flat-lying sedimentary strata, deformed along the axis and edges of the Victoria Land basin (VLB). A deep layered section (V5) is confined to the basement graben beneath the VLB. Shallower units (V1-V4) unconformably cover the basin, are intruded by volcanic rocks (V6) and extend elsewhere into the Ross Sea. CIROS and MSSTS drilling indicates early Oligocene ages for glacial-marine units V1-V3. Glacial erratics suggest a Late Cretaceous-Palaeogene age for V4 and the upper part of V5. Volcanic rocks (V6) may be of Jurassic-late Cenozoic age. Acoustic basement (V7) is probably pre-Jurassic sedimentary and igneous units. In most WRS areas, bathymetric and subsurface features are located where crustal-rifting uplifts occur, yet bathymetric orientations reflect glacial erosion. Greater subsidence and lesser sedimentation rates in the WRS than in the eastern Ross Sea (ERS) probably explain the structural trough beneath the VLB (WRS) versus the prograding sediment wedge beneath the ERS. (Auth.)

J-44127

Farley, K.A., Turekian, K.K., **Lead-210 in the circumpolar South Atlantic, Deep sea research**, Dec. 1990 37(12A), p.1849-1860, 31 refs.

Pb-210 activity in circumpolar waters of the South Atlantic is characterized by a sharply defined maximum at intermediate to shallow depths that is strongly correlated with the oxygen minimum. This feature, present throughout the southern ocean, is most likely locally maintained rather than advected from elsewhere. The highest Pb-210 activities in this region occur in the northern Weddell Sea, indicating a source of Pb-210-rich water in the west or north flank of the Weddell Sea Gyre. An estimate of the (Pb-210) deficiency rela-

tive to (Ra-226) shows that despite high biological productivity, the sediments underlying the southern ocean are not a major sink for Pb-210. (Auth.)

J-44128

Warren, B.A., **Suppression of deep oxygen concentrations by Drake Passage**, *Deep sea research*, Dec. 1990 37(12A), p.1899-1907, 20 refs.

By establishing a zone free of topographic barriers, Drake Passage denies any net meridional geostrophic flow across the zone on isopycnal surfaces in the approximate interval of potential-density anomaly = 27.5-27.8 mg/cu cm. It thus prevents the convective processes that occur in the southern ocean south of the zone from renewing water to the north of it in this density range by mean flow. Inasmuch as this interval coincides roughly with that of the oxygen-poor layers found at mid-depths in the South Indian and South Pacific Oceans, the Drake Passage constraint seems to contribute significantly to the suppression of oxygen concentrations in these layers. (Auth.)

J-44130

Muraleedharan, P.M., Mathew, B., **Water characteristics and transport of the Antarctic Circumpolar Current in the Indian Ocean**, *Indian Academy of Sciences. Proceedings. Earth and planetary sciences*, Dec. 1988 97(2), p.183-191.

DLC QE1.P733

Geostrophic velocities are computed across meridians 37E and 105E using hydrographic data. The estimated mass transport is represented on a temperature-salinity diagram. The characteristics of the water within the Antarctic Circumpolar Current at 37E and 105E are discussed. The computed transport agrees with the previous estimates. Transports due to the current between 45S and the antarctic continent at these two meridians are comparable. The westerly flow south of 42S at 105E is associated with a cyclonic eddy which appears to be a permanent feature, whereas the one at 50S is related to the topography of the region. (Auth.)

J-44132

Goyet, C., Beauverger, C., Brunet, C., Poisson, A., **Distribution of carbon dioxide partial pressure in surface waters of the Southwest Indian Ocean**, *Tellus*, Feb. 1991 43B(1), p.1-11, Refs. p.10-11.

Using data from different seasons (July 1984 and Feb.-Mar. 1985), the authors describe the geographical, annual, and seasonal variability of the partial pressure of carbon dioxide (pCO₂) in sea surface waters of the Southwest Indian Ocean. In subtropical regions, pCO₂ values are almost 45 micro-atm higher in summer than in winter. This variation is produced principally by the seasonal change of sea surface water temperature. In contrast, in the subantarctic region, pCO₂ values were observed 25 micro-atm lower in summer than in winter, in response to the predominant seasonal biological activity. This characteristic phase change of the seasonal oceanic surface pCO₂ signal with latitude appears to be a global phenomenon and is mirrored in the Northern Hemisphere. In the southern region of the Antarctic Convergence, both the measured and calculated pCO₂ values agree with those of the GEOSECS program, and confirm that this region of the ocean is probably a source of CO₂ to the atmosphere throughout the year. (Auth. mod.)

J-44135

Matishov, G.G., Pavlova, L.G., **General ecology and paleogeography of the polar oceans** [Obshchaia ekologiya i paleogeografiya poliarnykh okeanov], Leningrad, Nauka, 1990, 223p., In Russian. Refs. p.207-223.

An extensive literature review is presented of studies dealing with current and past features of polar marine ecosystems, climate and oceanography. The evolution of ecological conditions and living organisms of the world ocean is linked to the earth's geological past.

Influences of various types of human activity—such as fisheries, drilling for oil, and chemical pollution—on marine flora and fauna are related to changes in the polar ecosystems. Although the emphasis is primarily on the Arctic basin, the oceanographic frontal structure, sea ice, and biological production of antarctic water masses are also considered.

J-44188

Jeffers, J.D., Anderson, J.B., Lawver, L.A., **Evolution of the Bransfield basin, Antarctic Peninsula**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.481-485, 18 refs.

Marine geophysical data collected during five seasons in Bransfield Strait provide the basis for reconstructing the evolution of this complex basin. Seismic-reflection profiles and bathymetry show three main sub-basins and numerous smaller basin segments. Five stages in the evolution of Bransfield Strait are related to the progressive cessation of subduction along the margin of the northern Antarctic Peninsula during the Cenozoic. The early-mid-Neogene magmatic arc of the South Shetland Is. was later deformed by transpressional strike-slip faulting related to oblique convergence between the Aluk and antarctic plates. Boyd Strait opened in response to the late Miocene-early Pliocene ridge-trench collision south of the Hero fracture zone, while oblique convergence continued to the north. Bransfield Strait rifting began in the early Pliocene, but rapid sedimentation and diffuse igneous activity prevented the formation of correlatable magnetic anomalies. Recent igneous activity may be progressing toward a crudely organized seafloor-spreading system since short period high-amplitude magnetic anomalies are associated with the central volcanic ridge. (Auth.)

J-44193

Van Enst, J.W.A., **Pb-210 activities in Bransfield Strait sediments, Antarctic Peninsula: additional proof of hydrothermal activity**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.511-514, 7 refs.

Pb-210 in marine sediments may have two sources: atmospheric Pb-210 as the result of Rn-222 decay and from within the sediment as the result of Ra-226 decay. Activity profiles of Pb-210 and Ra-226, measured on samples of core 1327-1, suggest that the major Pb-210 source for Bransfield Strait basin sediments is from within the sediment. This is inferred from average constant activity down to 2 m, and strong coherence between the profiles. The Pb-210 source itself can be attributed to hydrothermal fluids within the sediments which establish a constant supply of U-238-series isotopes and secular equilibria between the daughter isotopes. Furthermore, a relation between grain size and Pb-210 activity exists, based on a comparison between the grain-size distribution curve and the activity profiles. (Auth.)

J-44231

Kennicutt, M.C., II, Sweet, S.T., Fraser, W.R., Stockton, W.L., Culver, M., **Grounding of the *Bahía Paraíso* at Arthur Harbor, Antarctica. 1. Distribution and fate of oil spill related hydrocarbons**, *Environmental science and technology*, Mar. 1991 25(3), p.509-518, 28 refs.

In Jan. to Mar. 1989 water, organisms, and sediments within a 2-mile radius of Arthur Harbor were contaminated with an estimated 600,000 L of petroleum spilled by the *Bahía Paraíso*. All components of the ecosystem were contaminated to varying degrees during the spill, including birds, limpets, macroalgae, clams, bottom-feeding fish, and sediments. The high-energy environment, the relatively small

volume of material released, and the volatility of the released product all contributed to limiting toxic effects in time and space. The most effective removal processes were evaporation, dilution, winds, and currents. Sedimentation, biological uptake, microbial oxidation, and photooxidation accounted for removal of only a minor portion of the spill. One year after the spill several areas still exhibited contamination. Subtidal sediments and the more distant intertidal locations were devoid of detectable PAH contaminants, whereas sediments near the docking facility at Palmer Station continued to reflect localized nonspill-related activities in the area. Arthur Harbor and adjacent areas continue to be chronically exposed to low-level petroleum contamination emanating from the *Bahía Paraíso*. (Auth. mod.)

J-44255

Ciesielski, P.F., Kristoffersen, Y., Scientific Party of ODP Leg 114, **Preliminary results of subantarctic South Atlantic Leg 114 of the Ocean Drilling Program (ODP)**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.645-650, 6 refs.

ODP Leg 114 drilled 12 holes at seven sites in the subantarctic South Atlantic during Mar.-May 1987. These sites are located on the Northeast Georgia Rise in the east Georgia Basin (Sites 699 and 700), Islas Orcadas Rise (Site 702), between the Islas Orcadas Rise and Mid-Atlantic Ridge (Site 701) and on the Meteor Rise (Sites 703 and 704). The recovered sediments provide the greatest stratigraphic representation of the Late Cretaceous-Cenozoic ever obtained from the southern ocean. Generally well preserved assemblages of all major microfossil groups provide excellent biostratigraphic control. A nearly continuous history of geomagnetic polarity reversals was obtained from the Late Cretaceous-Quaternary, with gaps only in the late Palaeocene-early Eocene and portions of the early-middle Miocene. The bio-magnetostratigraphic framework provided by these sites, and those recovered by Leg 113, will provide the first high-resolution geochronological record of the Late Cretaceous-Cenozoic southern ocean. The principal results, as well as the initial tectonic and palaeoenvironmental interpretations of the recently drilled sites, are described here. (Auth.)

J-44256

Barrett, P.J., Hambrey, M.J., Robinson, P.R., **Cenozoic glacial and tectonic history from CIROS-1, McMurdo Sound**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.651-656, 25 refs.

Glacigenic strata of Miocene-early Oligocene age have been cored in the CIROS-1 drillhole 12 km offshore on the western edge of the Victoria Land Basin. The core, which was taken continuously from 27 to 702 m below the seafloor, is dominated by muddy sandstone, sandy mudstone and diamictite, with lesser amounts of sandstone and conglomerate. The strata were deposited in a wave-influenced marine deltaic setting with glacial activity much in evidence. The interval from 27 to 366 m sub-seafloor (late Oligocene-early Miocene) was deposited in waters of varying depth and includes a significant proportion of diamictite (40%), interpreted as lodgement and water-lain till. Four periods of glaciation associated with low relative sea level are recorded, and considered to represent episodes of major ice build-up on the continent. The interval below 366 m (early Oligocene) is largely deep-water mudstone with sandstone beds and occasional conglomerate deposited from sediment gravity flows in the lower part. The strata also include scattered subangular-sub-rounded stones, many of which are faceted and striated, indicating some glaciation on land and ice calving at sea level in this region back to early Oligocene time. The thickness of the Oligocene-early Miocene section and the virtual absence of younger strata suggest this was

a significant period of subsidence for the Victoria Land basin and possibly also uplift for the adjacent Transantarctic Mountains. (Auth.)

J-44274

Ohshima, K.I., Ono, N., Takizawa, T., Ushio, S., **Note on water exchange under fast ice in Lützow-Holm Bay, Antarctica**, NIPR Symposium on Polar Meteorology and Glaciology, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1991, p.74-80, 15 refs.

Under coastal fast ice in the Ongul Strait near Showa Station, warmer, more saline, and oxygen-poorer water appears in mid-depth and deep layers from winter to spring every year. This water is explained as a result of mixing between Circumpolar Deep Water (CDW) and Winter Water (WW). This water becomes more like CDW and more homogenized with time from winter to spring, and in Dec. a mixing ratio of 1:3-1:4 for CDW to WW is required to explain the properties of the homogenized water. It is inferred that the CDW comes along the glacial troughs. Transport of CDW results in a significant amount of heat supply into the water under fast ice. (Auth.)

J-44316

Papoff, P., Betti, M., Giovannoni, G., **Individual spread of concentrations of alkali and earth-alkaline elements in sea water samples from Terra Nova Bay-Ross Sea (Antarctica)**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.1-6, 7 refs.

Results on the determination of alkali and earth-alkaline elements in filtered and acidified sea water samples from Terra Nova Bay are presented. The concentration values varied between 573-487, 8.05-5.04, 59.4-46.1, and 11.03-6.37 macro-M for sodium, potassium, magnesium and calcium, respectively; and 29.6-14.4 micro-M for lithium. For ten replicates in each sample on two different days, average relative standard deviations lower than 1% were obtained. (Auth.)

J-44317

Cremisini, C., Orlandi, C., Torcini, S., **Major, minor and trace elements in the surface waters at Terra Nova Bay. Review of obtained data from 1986 to 1989, Italian antarctic expeditions**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.7-16, 7 refs.

Major, minor and trace element concentrations are reported for 109 samples of meltwaters, streams and lakes taken at 45 different points in Terra Nova Bay. The chemical composition of the analyzed waters is clearly affected by salt of marine origin. The influence of sea spray is very important; sodium and chlorine are the dominant ions while rock weathering is a subordinate source of chemicals. Generally speaking, trace element levels do not exhibit anomalous values. (Auth.)

J-44318

Capodaglio, G., Scarponi, G., Toscano, G., Cescon, P., **Cadmium complexation in surface seawater of Terra Nova Bay (Antarctica)**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.17-25, 10 refs.

Cadmium complexation in the surface waters of Terra Nova Bay, collected during the 1987/88 and 1988/89 Italian expeditions, was studied by differential pulse anodic stripping voltammetry (DPASV). Total dissolved cadmium concentration ranged between 0.08 and 0.69 nM. Notable differences for the Cd content were observed between samples collected under the pack and those taken after the sea ice had melted. A possible explanation is given. The inorganic or ASV-labile fraction was 21-75%. Data obtained were consistent with one class of organic ligands whose concentration varied between 0.12 and 1.59 nM. The mean value for the conditional stability constant was $\log K'(\text{cond})=9.5$. (Auth/)

J-44319

Saini, G., Baiocchi, C., Giacosa, D., **Determination of some heavy metals in antarctic snow and coastal sea water**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.27-30, 6 refs.

Samples of seawater and snow collected by the Italian expedition in Antarctica in 1988-89 have been analyzed for Cu, Ni, Cr, Cd and Mn. Preconcentration of the samples has been made by reductive precipitation for seawater and by lyophilisation for snow. Determinations have been made by GF AAS. The results are discussed. (Auth.)

J-44320

Mentasti, E., Porta, V., Abollino, O., Sarzanini, C., **Metal trace determination in seawater and lake water samples from Antarctica**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.31-36, 5 refs.

A series of metal ion traces in Ross Bay and lake water (Carezza Lake) have been determined using atomic emission and atomic absorption spectroscopy. A cold vapor atomic absorption device has been employed for the determination of mercury. In order to reach the needed sensitivity, especially for sea water samples, enrichment procedures based on precomplexation/adsorption on a microcolumn were optimized and adopted. Such procedures allow a closed-loop on-line treatment of the sample which ensures a very limited sample alteration. (Auth.)

J-44321

Frache, R., **Trace metals distribution in water, particulate matter and sediments in the Ross Sea and inland lakes (Antarctica)**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.37-46, 3 refs.

The concentration values of some trace metals in sea water, particulate matter and sediment in samples collected during the Italian antarctic expedition of 1988-1989 are reported and shown in tables. The data are briefly annotated. Comparison of data shows that the mineralogic composition of lake and sea sediments is quite different. The Cr, Cu, Ni and Fe concentrations in particulate matter are lower than those found in waters with high anthropogenic input. (Auth. mod.)

J-44324

Desideri, P., Lepri, L., Checchini, L., **Organic compounds in antarctic matrices: sea water, particulate, pack and sediments**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.63-70, 3 refs.

Biogenic and anthropogenic organic compounds present in sea sediments taken from Terra Nova Bay during the 1987/88 expedition were identified. Sea water, pack-ice, sea water under the pack and melted pack water samples were taken from the bay during the 1988/89 expedition and were analyzed for these compounds. Results show the presence of several biogenic and anthropogenic organic compounds in the sea water. (Auth. mod.)

J-44325

Colombini, M.P., Fuoco, R., **Evaluation of polychlorobiphenyl content in sea water samples from Terra Nova Bay-Ross Sea (Antarctica)**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.71-75, 12 refs.

The paper describes the most significant findings in the determination of the total content of PCBs in sea water samples from Terra Nova Bay, collected during the Italian expedition in 1988-1989. Results show the following: low PCB contamination, which is typical of oceanic waters; the total PCB concentration obtained is comparable with that reported by other authors for the same areas, and about 10 times higher than the values obtained by Tanabe; and work is in progress for analyzing sea water and sediment samples. These results will allow one to show whether there is a pack melting effect on the concentration of these pollutants, and to better correlate the concentrations of the aqueous phase, suspended matter and sediments. (Auth. mod.)

J-44326

Morselli, L., Zappoli, S., **Further evaluation of the occurrence of PCBs in Terra Nova Bay, Ross Sea, Italy**. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.77-80, 5 refs.

Several researchers have already pointed out evidence of anthropogenic contamination of the antarctic environment. In this communication, with preliminary results of the analysis performed on samples collected during the winter 1988-89 Italian scientific campaign, it is possible to see evidence of a diffuse PCB contamination in the Terra Nova Bay area. The aim of the sampling performed was to make an initial verification of the previously obtained data, and to investigate the relation of various geoclimatic events (glaciers and pack thaws) to the occurrence of PCB contamination. A first check on soil contamination levels was also performed. (Auth. mod.)

J-44327

Buiarelli, F., Cartoni, G., Vicedomini, M., Zoccolillo, L., **Long lasting pesticides in antarctic surface water and sediments**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.81-87.

The procedure used for the analysis of surface water and sediment samples, taken from the Ross Sea region during the 1988-89 Italian expedition, is reported. After solvent extraction and purification, sediment samples were examined for the presence of stable pesticides by GC with ECD and GC/MS. Many peaks of chlorinated compounds are observed in GC-ECD, and a search for the most common pesticides was carried out by SIM-GC/MS. (Auth.)

J-44329

Loglio, G., **Selective transport phenomena at the air-water interface in coastal antarctic surface water: time variability**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.95-102, 5 refs.

In the limits imposed by the thermal treatment of the samples, some differences in the mean physico-chemical parameters appear between the mean values found in the surface coastal waters in Terra Nova Bay and the samples taken in the previous campaign at a greater distance from the coast. Snow sampled at non-polluted sites shows traces of marine aerosols with highly surface-active matter that could justify an anomalous enrichment of some particular component. (Auth.)

J-44330

Calvelli, G., Ceccato, D., Mittner, P., **Processes of transport of particulate matter at the air-water interface in coastal antarctic surface waters (time variability): a multielemental analysis. Progress report**, Italy. Programma Nazionale di Ricerche in Antartide. Comitato Nazionale per la Ricerca. Progetto Antartide: impatto ambientale. Convegno, Roma, 8-9 giugno, 1990. (Environmental impact in Antarctica. Meeting, Rome, Italy, June 8-9, 1990), Rome, 1990, p.103-106, 4 refs.

A multielemental characterization of particulate matter for four pairs of antarctic surface waters has been performed within an investigation of air-sea transport processes. Quite significant differences in composition are found for "twin" samples and for the derived processes. This effect must presumably be attributed to the use of a "non-standard" freezing procedure of the initial samples. Measurements for other samples and analysis are in progress. (Auth.)

J-44345

Lee, S.H., Kim, K.T., Kim, S.H., **Trace metals in the surface waters of Maxwell Bay, King George Island, Antarctica**, *Korean journal of polar research*, Dec. 1990 1(2), p.11-15, 8 refs.

The Cd, Cu, Pb and Zn concentrations in the surface waters of Maxwell Bay, King George I., were measured during the summer of 1989. The trace metal concentrations appeared to be generally low in the central portion of the Bay, and high in Marian Cove. The trace metal levels in Maxwell Bay were considerably higher than those near Antarctica or in the South Sea of Korea. (Auth.)

J-44364

Kennett, D., ed, Masterson, A., ed, Stewart, N.J., ed, **Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica**, College Station, Texas A and M University, 1990, 1,033p., Refs. passim. For individual papers see B-44386, B-44388, B-44512, E-44365, E-44367 through E-44376, E-44379 through E-44383, E-44389 through E-44393, E-44488 through E-44492, E-44498 through E-44503, E-44505, E-44508 through E-44511, E-44513, E-44514, J-44366, J-44377, J-44378, J-44387, J-44493 through J-44497, J-44504, J-44506, J-44507, L-44384 and L-44385.

DLC QE39.T49b

The *Scientific Results* volumes of the *Proceedings of the Ocean Drilling Program* contain specialty papers presenting the results of up to one and one-half years of research in various aspects of scientific ocean drilling. Leg 113 (Jan.-Mar. 1987) of the Ocean Drilling Program (ODP) was the first expedition to drill in the Weddell Sea sector of Antarctica, a remote, ice-infested region presenting unusual operational difficulties. Vol.113 presents results from the ODP, where scientists use a specially equipped ship to sample and measure the properties of the submerged part of the Earth's crust. These data are then synthesized with other information to yield new insights into earth processes. The 56 papers presented in this volume are divided into the following sections: petrology, geophysics, sedimentology, geochemistry, physical properties and downhole logging, magnetostratigraphy, paleontology and biostratigraphy, stable isotopes of sediments, and synthesis. Short reports consisting of good data that are not ready for final interpretation are segregated in a section in the back of the volume called Data Reports.

J-44366

Nagao, T., **Heat flow measurements in the Weddell Sea, Antarctica: ODP Leg 113**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.17-26, 30 refs.

DLC QE39.T49b

From Jan. to Mar. 1987, heat flow measurements were tried at four sites during ODP Leg 113, in the Weddell Sea. At Site 690 (Maud Rise), a convex upward shaped temperature vs. depth profile was observed. This profile cannot be explained by steady-state conduction through solid materials only. It is concluded that the minimum heat flow value at Site 690 is 45 mW/sq m. A prominent bottom simulating reflector (BSR) was observed at 600 mbsf at Site 695. However, the observed temperature is too high to explain the BSR as a gas hydrate. The origin of the BSR remains unknown, although it is probably of biogenic origin as observed in the Bering Sea during DSDP Leg 19. After correcting for the effects of sedimentation, heat flow values at Sites 695 and 696 are 69 and 63 mW/sq m, respectively. Heat flow data were compiled south of 50S. In the Weddell Sea region, the eastern part shows relatively low heat flow in comparison with the western part, with the boundary between them at about 15 W longitude. (Auth.)

J-44377

Egeberg, P.K., Abdullah, M.I., **Diagenetic factors controlling the dissolved organic carbon (DOC) in pore water from deep sea sediments (ODP Leg 113, Weddell Sea)**, *Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica*, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.169-177, 41 refs.

DLC QE39.T49b

Dissolved organic carbon (DOC) was determined in pore water extracted from pelagic and hemipelagic sediments recovered during

Leg 113. DOC concentration varied between 1.82 and 13.6 mg C/L, which is one to two orders of magnitude less than previously reported for hemipelagic sediments. It is argued that this difference is related to differences in the intensity of degradation of organic matter. As a first approximation it is found that in reducing sediments, the level of DOC is proportional to the intensity of sulfate reduction. It is suggested that DOC is formed by different mechanisms in oxic and reducing environments. (Auth.)

J-44378

Kawahata, H., Ishizuka, T., Nagao, T., **Amino acids in the interstitial waters from ODP Site 695 in the Weddell Sea, antarctic ocean**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.179-187, Refs. p.186-187.

DLC QE39.T49b

Site 695 lies on the southeast margin of the South Orkney microcontinent on the northern margin of the Weddell Sea. The inorganic properties of interstitial waters at this site, including sulfate reduction, biogenic methane production, and high concentrations of ammonia and phosphate, imply high microbial activity. However, no clear relationship between amino acid composition and concentration and the type of microbial activity (e.g., sulfate reduction or methane production) can be identified. Predominance of DFAA (dissolved free amino acids) over DCAA (dissolved combined amino acids) in interstitial waters of Lithologic Units I and II is contrary to the predominance of DCAA over DFAA in other interstitial waters and seawater. The comparison of amino acid compositions between DCAA and siliceous plankton suggests that the DCAA in interstitial waters originally comes from amino acids derived from siliceous plankton. However, other sources which are much enriched in glutamic acid contribute to the DCAA composition. (Auth. mod.)

J-44387

Mutterlose, J., Wise, S.W., Jr., **Lower Cretaceous nannofossil biostratigraphy of ODP Leg 113 holes 692B and 693A, continental slope off East Antarctica, Weddell Sea**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.325-351, Refs. p.339-340.

DLC QE39.T49b

Organic-rich, moderately to sparsely nannofossiliferous Lower Cretaceous claystones ("black shales") were cored at two Ocean Drilling Program Leg 113 sites on the continental slope of East Antarctica off Queen Maud Land. A 39 m section at Site 692 yielded a Neocomian assemblage of limited diversity with rare *Cyclagelosphaera deflandrei*, *Diadorhombus rectus*, and *Cruciellipsis cuvillieri*, and is probably Valanginian in age. A 70 m section at Site 693 is assigned to the *Rhagodiscus angustus* Zone (late Aptian-early Albian in age). The latter zone is represented at DSDP sites on the Falkland Plateau, but equivalents to the Neocomian section are absent there, probably due to a disconformity. *Watznaueria barnesae* is the dominant species at both ODP sites, but it shares dominance with *Repagulum parvidentatum* at Site 693, where they total 70-90% of the assemblage; their dominance is attributed to a paleogeographic setting within a restricted basin rather than to postdepositional dissolution of other species. The evolutionary development of this restricted basin and its eventual ventilation in early Albian times is discussed in terms of the regional stratigraphy and the breakup and dispersal of southwestern Gondwanaland. One new species *Corollithion covingtonii*, is described. (Auth.)

J-44457

Naganobu, M., **Vertical distributions of temperature, salinity and geostrophic flow along 175E in the Ross Sea sector of the southern ocean in January 1967 (extended abstract)**, NIPR Symposium on Polar Biology, Proceedings, No.4, Tokyo, National Institute of Polar Research, 1991, p.171-173, 1 ref.

This paper describes the vertical distributions of temperature, salinity and geostrophic flow, almost to the sea bottom, from 63 deg 03S to 77 deg 14S near the continental shelf of Antarctica, along 175E in the Ross Sea area of the Pacific sector, using the Eltanin data. The temperature value of 0 C or less, indicating the Antarctic Surface Water, was observed from the southernmost part of the Ross Sea as far as 65S. In the deep layer near the bottom in the Ross Sea, the lowest water temperature (-1.94 C) and the highest salinity (34.935 per mill) were recorded. On the whole, the geostrophic flow across this section had an eastward component, except the westward flow south of 74 deg 30S, which is regarded as part of the clockwise current in the Ross Sea. (Auth. mod.)

J-44462

Stanton, B.R., **Ocean circulation and ocean-atmosphere exchanges**, *Climatic change*, Apr. 1991 18(2-3), p.175-194, 12 refs.

The oceans have a major influence on climate through the ocean-atmosphere exchange processes. However, limits to the present understanding of some of these processes is an important factor in the inability to model climate change precisely. Present knowledge of ocean structure and circulation is reviewed, with a particular emphasis on the Southern Hemisphere oceans, and the major ocean-atmosphere exchanges are examined. The influence of interhemispheric asymmetries in global warming scenarios is discussed. An improved understanding of the oceans and therefore better climate models will result from planned international ocean research experiments in the 1990s. (Auth.)

J-44465

Lutjeharms, J.R.E., Valentine, H.R., **Sea-level changes: consequences for the Southern Hemisphere**, *Climatic change*, Apr. 1991 18(2-3), p.317-337, Refs. p.335-337.

One of the measurable symptoms of man-induced climatic change is a global rise in mean sea-level. A review of the suggested mechanisms for sea-level rise is given, supported by a critical discussion of present predictions and predictive models. The data base on which these predictions are based is geographically inhomogeneous and particularly sparse in the Southern Hemisphere. It is suggested that since the Southern Hemisphere has particular observational requirements because of a higher ratio of ocean to terrestrial areas, particular attention in international monitoring programs be given to it. This has special relevance to sea-level measurements in hostile environments such as off Antarctica. (Auth. mod.)

J-44466

Bernal, P.A., **Consequences of global change for oceans: a review**, *Climatic change*, Apr. 1991 18(2-3), p.339-359, Refs. p.357-359.

The possible effects of global climate change on the oceans are described through a review of the results produced by GCMs that explicitly incorporate the dynamics of the interior of world oceans. Changes at asymptotic equilibrium influence the whole water column, but equilibrium in the deep sea is reached after several thousand years. The transient response of these models after 25 years following the onset of the perturbation (doubling or quadrupling of atmospheric CO₂) affects the upper layer of the oceans (<2000 m), producing an increase in temperature between 2-4 C. Models with realistic geography, as compared with simplified ones with N-S symmetry, produce

warming near the north pole but a small cooling close to the antarctic continent. The main impacts of the predicted changes upon marine ecosystems are identified within several possible scenarios. (Auth. mod.)

J-44477

Stocker, T.F., Wright, D.G., **Rapid transitions of the ocean's deep circulation induced by changes in surface water fluxes**, *Nature*, June 27, 1991 351(6329), p.729-732, 17 refs.

Deep water in the world's oceans flows predominantly from the northern North Atlantic into the Pacific, slowly upwells on the way to become part of the upper warm-water circulation, and returns to the North Atlantic. The stability of this thermohaline conveyor belt has recently been questioned on the basis of palaeoclimatic data from deep-sea sediment and ice cores. Different modes of deep circulation have been confirmed in numerical ocean models, and the present-day circulation has been shown to be sensitive to changes in the surface-water budget. Here an idealized model is used to examine the hypothesis that small changes in the atmospheric flux of fresh water from the Atlantic to the Pacific could force the thermohaline circulation to switch between two stable modes. Results indicate that a decrease of this flux can reverse the Atlantic circulation, although the Pacific thermohaline circulation does not change direction. This is consistent with reconstructions of conditions in the Atlantic Ocean during the last glacial obtained from deep-sea cores. To reestablish the conveyor belt, the fresh-water flux need be increased only slightly beyond its present value. Sea water circulation in this study reaches into the southern ocean to 60S from both the Atlantic and Pacific sides. (Auth. mod.)

J-44493

Thomas, E., **Late Cretaceous through Neogene deep-sea benthic foraminifers (Maud Rise, Weddell Sea, Antarctica)**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.571-594, Refs. p.586-589.

DLC QE39.T49b

Upper abyssal to lower bathyal benthic foraminifers from ODP Sites 689 (present water depth 2080 m) and 690 (present water depth 2941 m) on Maud Rise are reliable indicators of Maestrichtian through Neogene changes in the deep-water characteristics at high southern latitudes. Benthic foraminiferal faunas were divided into 8 assemblages. There were minor faunal changes at the Cretaceous/-Tertiary boundary (less than 14% of the species had last appearances at Site 689, less than 9% at Site 690). The most abrupt benthic foraminiferal faunal event occurred in the latest Paleocene, when the diversity dropped by 50% (more than 35% of species had last appearances) over a period of less than 25,000 years; after the extinction the diversity remained low for about 350,000 years. The highest diversities of the post-Paleocene occurred during the middle Eocene; from that time on the diversity decreased steadily at both sites. Data on faunal composition (percentage of infaunal versus epifaunal species) suggest that the waters bathing Maud Rise were well ventilated during the Maestrichtian through early Paleocene as well as during the latest Eocene through Recent. Benthic foraminiferal data (supported by carbon and oxygen isotopic data) suggest that there was a short period of intense formation of warm, salty deep water at the end of the Paleocene (with a duration of about 0.35 m.y.), and that less intense, even shorter episodes might have occurred during the late Paleocene and early Eocene. The faunal record from the Maud Rise sites agrees with published faunal and isotopic records, suggesting cooling of deep to intermediate waters in the middle through late Eocene. (Auth. mod.)

J-44494

Mohr, B.A.R., **Eocene and Oligocene sporomorphs and dinoflagellate cysts from Leg 113 drill sites, Weddell Sea, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.595-612, Refs. p.604-606.

DLC QE39.T49b

Palynological studies were carried out on Paleogene sections from Sites 693 and 696 of Ocean Drilling Project Leg 113 in the Weddell Sea region. Dinoflagellate cysts and sporomorphs were recovered at Site 696 indicating a middle Eocene to late Eocene/earliest Oligocene age for a glauconitic silt/sandstone. At Site 693 early Oligocene siliciclastic mud contains a low diversity palynoflora. In an upper Oligocene section (Site 693) only rare, reworked Mesozoic palynomorphs were encountered. The middle Eocene was a warm period in the Orkney region with good growing conditions for a warm temperate *Nothofagus*/conifer forest with an admixture of Proteaceae. Temperate surface water masses, which allowed the growth of a reasonably diverse dinocyst assemblage (ca. 15-20 species), persisted until the end of the Eocene at Site 696. Late early Oligocene sediments of Site 693 (antarctic continental margin) contain only a low diversity dinocyst flora (two species). The major Cenozoic cooling event in the Weddell Sea region probably occurred at the Eocene/Oligocene boundary. A second dramatic climatic deterioration seems to have taken place during the late early/early late Oligocene, when dinocysts disappeared at the Dronning Maud Land margin area. (Auth. mod.)

J-44495

Pospichal, J.J., Wise, S.W., Jr., **Paleocene to Middle Eocene calcareous nannofossils of ODP Sites 689 and 690, Maud Rise, Weddell Sea**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.613-638, Refs. p.629-631.

DLC QE39.T49b

The nannofossil-foraminifer oozes and chalks recovered from Maud Rise at 65S in the Weddell Sea provide a unique opportunity for biostratigraphic study of extremely high southern latitude carbonate sediments. The presence of warm water index fossils such as the discoasters and species of the *Tribrachiatus* plexus facilitate the application of commonly used low latitude calcareous nannofossil biostratigraphic zonation schemes for the upper Paleocene and lower Eocene intervals. Though not extremely diverse, the assemblage of discoasters in the upper Paleocene and lower Eocene calcareous oozes is indicative of warm, relatively equable climates during that interval. Associated coccolith assemblages are quite characteristic of high latitudes with abundant *Chiasmolithus*, *Prinsius*, and *Toweius*. Climatic cooling is indicated for middle Eocene sediments by assemblages that contain very abundant *Reticulofenestra*, lack common discoasters and sphenoliths and are much less diverse overall. Two new taxa are described, *Biscutum? neocoronum* n. sp. and *Amithalithina sigmundii* n. gen., n. sp. (Auth. mod.)

J-44496

Wei, W.C., Wise, S.W., Jr., **Middle Eocene to Pleistocene calcareous nannofossils recovered by Ocean Drilling Program Leg 113 in the Weddell Sea**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.639-666, Refs. p.658-660.

DLC QE39.T49b

Long sequences of Upper Cretaceous through Quaternary sediments rich in calcareous and siliceous microfossils were recovered at Sites 689 and 690 on Maud Rise off East Antarctica. These sites have become the southernmost anchor in the Atlantic Basin for bio-, magneto-, chemostratigraphic, and paleobiogeographic studies. ODP sites 692 and 693 on the Weddell Sea margin of East Antarctica and Site 696 on the South Orkney microcontinent of West Antarctica yielded calcareous nannofossils within some stratigraphic intervals. Sites 691, 692, 694, 695, and 697 did not recover Cenozoic calcareous nannofossils. Calcareous nannofossil biostratigraphy suggests a major hiatus across the Paleogene/Neogene boundary at Sites 689 and 690, and two additional hiatuses in the middle Eocene-lower Oligocene section at Site 690. Comparison of calcareous nannofossil abundances in a latitudinal transect shows: *Reticulofenestra bisecta* is a temperate-water species and its last occurrence, which crosses below that of *Chiasmolithus altus* at Maud Rise, is not applicable for the Paleogene/Neogene boundary in high southern latitude areas; *Clausiococcus fenestratus* is rare or absent at Maud Rise and cannot be used as a marker; *Coccolithus formosus* is a warm-water species which disappeared earlier toward higher latitudes. Calcareous nannofossil assemblages indicate that by at least the middle Eocene, surface water temperatures became considerably lower in the high southern latitudes than in the middle-latitude areas, and that there have been more extreme cold events in the high latitudes during the Neogene. *Bicolumnus ovatus* n. gen., n. sp. is proposed in this paper. (Auth. mod.)

J-44497

Kennett, D.M., Kennett, J.P., ***Bolboforma Daniels and Spiegler, from Eocene and Lower Oligocene sediments, Maud Rise, Antarctica***, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.667-673, 17 refs.

DLC QE39.T49b

Five species of *Bolboforma* have been found in middle Eocene to lower Oligocene sediments from Maud Rise, the first reported *Bolboforma* from the antarctic Paleogene. Highest species diversity of *Bolboforma* in the Weddell Sea occurred during the late Eocene, after which all but one important species disappeared before the Eocene/Oligocene boundary (36.5 Ma). The remaining species, *B. irregularis*, disappeared soon after, during the earliest Oligocene. The disappearance of *Bolboforma* in the region of Antarctica coincided with significant climatic cooling that occurred at the end of the Eocene and during the earliest Oligocene, when subpolar replaced temperate conditions. *Bolboforma* is not known from younger sediments in the Antarctic except for a brief interval during the late early Miocene, an interval of Neogene climatic warmth. The presence of *Bolboforma* in Eocene to lower Oligocene sequences in the Weddell Sea is therefore consistent with this taxon's previously recognized association with temperate water masses. *Bolboforma* is of limited biostratigraphic value at present, because of relatively long stratigraphic ranges and diachronous extinctions. A new species *Bolboforma antarctica*, is described, exhibiting a stratigraphic range from middle middle Eocene to the upper Eocene (approximately 44 to 39 Ma). (Auth. mod.)

J-44504

Barrera, E., Huber, B.T., ***Evolution of antarctic waters during the Maestrichtian: foraminifer oxygen and carbon isotope ratios, Leg 113***, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.813-827, Refs. p.822-823.

DLC QE39.T49b

Oxygen and carbon isotopic ratios were measured from Maestrichtian benthic and planktonic foraminifer species and bulk carbonate samples from ODP Sites 689 and 690, drilled on the Maud Rise during Leg 113. Careful scanning electron microscope observations reveal that test calcite in some intervals was diagenetically altered, although Sr/Ca and isotopic ratios of these tests do not appear to have been modified significantly. Foraminifer delta O-18 values at both sites document a cooling trend during early Maestrichtian time, a rapid drop in water temperatures at the time of the first appearance of *Abathomphalus mayaroensis* in the high southern latitude regions (about 69.9 Ma), and lower water temperatures during late Maestrichtian time. Delta C-13 values record a depletion in C-13 in the latest early Maestrichtian time beginning at about 72.2 Ma, just prior to the sharp late Maestrichtian increase in delta O-18 values. The trends are similar to those previously reported for well-preserved benthic foraminifer species from Seymour I. Paleotemperature estimates are also comparable to those at Seymour I. and suggest temperate climatic conditions in Antarctica and that bottom waters in the southern South Atlantic region were of antarctic origin. Benthic and planktonic foraminifer delta C-13 values fluctuate sympathetically, and are higher in upper Maestrichtian sediments than in the lower Maestrichtian sequence. (Auth.)

J-44506

Stott, L.D., Kennett, J.P., Shackleton, N.J., Corfield, R.M., ***Evolution of antarctic surface waters during the Paleogene: inferences from the stable isotopic composition of planktonic foraminifers, ODP Leg 113***, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.849-863, 27 refs.

DLC QE39.T49b

The oxygen and carbon isotopic composition have been measured for numerous Paleogene planktonic foraminifer species from Maud Rise. The results show that the early Paleocene was marked by cooler surface-water conditions compared to the Cretaceous, and possibly a less well developed thermocline. The late Paleocene and early Eocene saw the expansion of the thermocline as antarctic surface waters became warm-temperate to subtropical. The late Paleocene to early Eocene thermal maximum was punctuated by two brief excursions during which time the entire antarctic water column warmed and the meridional temperature gradient was reduced. The first of these excursions occurred at the Paleocene/Eocene boundary, in association with a major extinction in deep sea benthic foraminifers. The second excursion occurred within the early Eocene at about 54.0 Ma. The thermal maximum of the early Eocene ended with the initiation of a long-term cooling trend at 52.0 Ma. This cooling trend was associated with reduced seasonality, and diminished structure and/or duration of the seasonal thermocline. The cooling trend was punctuated by three major cooling steps at 43.0, 40.0, and 36.0 Ma. (Auth. mod.)

J-44507

Kennett, J.P., Stott, L.D., ***Proteus and Proto-oceanus: ancestral Paleogene oceans as revealed from antarctic stable isotopic results; ODP Leg 113***, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.865-880, Refs. p.877-878.

DLC QE39.T49b

Benthic oxygen and carbon isotopic results from a depth transect on Maud Rise provide the first evidence for Warm Saline Deep Water (WSDW) in the Paleogene oceans. Distinct reversals occur in the oxygen isotopic gradient between the shallower Hole 689B (Eocene depth about 1400 m; present-day depth 2080 m) and the deeper Hole 690B (Eocene depth about 2250 m; present-day depth 2914 m). The

isotopic reversals, well developed by at least 46 Ma (middle middle Eocene), existed for much of the remaining Paleogene. The results show that deep waters at Hole 690B were significantly warmer than deep waters at the shallower Hole 689B. A progressive decrease and eventual reversal in benthic to planktonic $\delta^{18}O$ gradients in Hole 690B demonstrate that the deeper waters became warmer relative to antarctic surface waters during the Eocene. The ocean during the Eocene, and perhaps the Paleocene, is inferred to have been two-layered, consisting of warm, saline deep waters formed at low latitudes and overlain by cooler waters formed at high latitudes. This thermospheric ocean, dominated by halothermal circulation, is named Proteus. An intermediate condition, Proto-oceanus, combined both halothermal and thermohaline processes. The sequence of high latitude major climatic change inferred from the oxygen isotopic records is as follows: generally cooler earlier Paleocene; warming during the late Paleocene; climax of Cenozoic warmth during the early Eocene and continuing into the early middle Eocene; cooling mainly in a series of steps during the remainder of the Paleogene. Salinity has played a major role in deep ocean circulation, and thus paleotemperatures cannot be inferred directly from the oxygen isotopic composition of Paleogene benthic foraminifers without first accounting for the salinity effect. (Auth. mod.)

J-44553

Jeffers, J.D., Anderson, J.B., **Sequence stratigraphy of the Bransfield Basin, Antarctica: implications for tectonic history and hydrocarbon potential**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.13-29, 44 refs.

DLC TN870.5.A63 1990

Application of sequence stratigraphic concepts to seismic reflection profiles from the Bransfield Basin indicates that this modern backarc basin began to form during the waning stages of subduction at the South Shetland Trench at about 4 Ma. Two distinct systems tracts stack to form depositional sequences; organic-rich hemipelagic sediments drape the basin during highstands/interglacial periods, whereas large volumes of glacially eroded terrigenous sediments prograde into the basin during lowstands/glacial maxima. Although the juxtaposition of organic-rich diatomaceous muds with the high heat flow of the backarc spreading system is favorable for the generation of hydrocarbons, reservoir quality sands and suitable traps have yet to be identified. (Auth.)

J-44560

Gambôa, L.A.P., Maldonado, P.R., **Geophysical investigations in the Bransfield Strait and in the Bellingshausen Sea, Antarctica**, *American Association of Petroleum Geologists. AAPG studies in geology*, July 1990 No.31, Antarctica as an exploration frontier—hydrocarbon potential, geology, and hazards. Edited by B. St. John, p.127-141, 40 refs.

DLC TN870.5.A63 1990

There is a complex geologic evolution and structure of the Bransfield Basin and the Bellingshausen continental margin. The Bransfield Basin, within the Bransfield Strait, has an asymmetrical profile with a steeper slope along its northern margin and a conspicuous spreading center closer to the South Shetland Is. A sedimentary wedge deposited along the southern margin of the basin forms the northern continental margin of the Antarctic Peninsula. Structural features and sedimentary sequences in this wedge show an Atlantic-type margin setting with an older rift sequence and a younger drift sequence. The Bellingshausen continental margin shows a well-developed continental rise, including a deep-sea fan to the north of Adelaide I., a steep continental slope and a broad continental shelf. At the outer shelf, clinoforms indicate a prograding shelf to slope environment similar to that of the continental shelf of an Atlantic-type

margin. These sediments have prograded above an erosional unconformity, below which tilted and faulted layers are observed and appear to represent an earlier "active" margin setting. A basement high occurs at the eastern limit of the younger passive margin sedimentary wedge, and a closed and buried basin has been discovered to the east of the basement high. The basement high and the closed basin could represent an eroded island arc and a fossil backarc basin, respectively. (Auth.)

J-44640

Wei, W.C., **Evidence for an earliest Oligocene abrupt cooling in the surface waters of the southern ocean**, *Geology*, Aug. 1991 19(8), p.780-783, 30 refs.

Quantitative analysis of upper Eocene-upper Oligocene calcareous nannofossil assemblages from five Ocean Drilling Program sites in the Atlantic and Indian Ocean sectors of the southern ocean reveals an abrupt increase in cool-water taxa at the top of magnetic Subchron C13R ca. 35.9 Ma, coincident with an enrichment of about 1 per mill $\delta^{18}O$ in the planktonic foraminifers at these sites. The synchrony of the abrupt increase in cool-water taxa in the southern ocean renders this event a useful biostratigraphic datum at southern high latitudes. This earliest Oligocene cool-water taxa increase was the sharpest and largest during the late Eocene-late Oligocene interval, and indicates a drop in surface-water temperature of more than 3°C in the southern ocean. This suggests that the earliest Oligocene $\delta^{18}O$ shift represents primarily a temperature signal; a small portion (about 0.2 per mill) is attributable to a global ice-volume increase. (Auth.)

J-44642

Soliankin, E.V., ed, Danilov, A.I., ed, Makarov, R.R., ed, Vsesoiuznyi nauchno-issledovatel'skii institut morskogo rybnogo khoziaistva i okeanografii, **Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities. Collected papers** [Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. Sbornik nauchnykh trudov], Moscow, VNIRO, 1990, 245p., In Russian with English summary. Refs. passim. For individual papers see B-44649 through B-44655, and J-44644 through J-44648.

This volume contains a collection of papers on Soviet oceanographical investigations of the Weddell Gyre, the largest cyclonic circulation system of the Antarctic. In addition to papers with special emphasis on the eastern area of the region, the collection presents works on the hydrophysical structure of the entire Atlantic sector of the Antarctic. Articles synthesize results of long term biological observations which permit one to estimate the distribution and population structure of krill in the Weddell Gyre and adjacent waters, and the distribution of euphausiid larvae and of the meso- and ichthyoplankton (mesopelagic species). An attempt is made to understand the role of frontal zones as ecological boundaries in antarctic waters. (Auth. mod.)

J-44643

Guretskii, V.V., Danilov, A.I., Malek, V.N., **Climatic structure of the Weddell Gyre** [Klimaticheskaiia struktura krugovorota Ueddella], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.4-31, In Russian with English summary. Refs. p.29-31.

Ocean temperature and salinity fields were constructed for the area south of 50S, from the Antarctic Peninsula to 40E, on the basis of records from 6145 oceanographic stations. Thermohaline characteristic fields were constructed on the grid of 1 deg by latitude and 2 deg by longitude. These data sets laid the basis for the description of the cyclonic Weddell Gyre, including the thermohaline structure and circulation. (Auth. mod.)

J-44644

Fedulov, P.P., Shnar, V.N., **Frontal zone and water structure of the Weddell Gyre** [Frontal'naia zona i struktura vod krugovorota Ueddella], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.31-48, In Russian with English summary. Refs. p.45-48.

Current research on the circulation of water masses in the Atlantic sector of the Antarctic is reviewed. Two medium scale eddies exist along side the large scale cyclonic Weddell Gyre. The Weddell-Scotia confluence to the south of the so-called secondary frontal zone (with sharp fluctuations of physical and chemical characteristics of waters) presents a narrow area of unusually homogeneous vertical structure of water masses, believed to be caused by the density processes in the confluence. A similar structure is found in the east of the Weddell Gyre, at its open boundaries, where waters originating from the Weddell Sea come into contact with the Antarctic Circumpolar Current. (Auth. mod.)

J-44645

Bagriantsev, N.V., Klepikov, A.V., Polonskiĭ, V.E., **Oceanographic investigations of the Weddell Gyre during the POLEX-South-87 expedition** [Okeanograficheskie issledovaniia krugovorota Ueddella v ekspeditsii "POLEKS-IUg-87"], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.48-60, In Russian with English summary. 13 refs.

According to data records from POLEX-South-87, the open boundary of the Weddell Gyre is represented by a deep frontal division characterized primarily by significant horizontal temperature gradients in the maximum temperature layer. Peculiarities of thermohaline characteristics at the section along 10E, particularly in areas of its crossing of the north and south frontal divisions of the Weddell Gyre, are discussed. Two zones of large-scale isotherm rise were found at the quasi-latitude section within the Weddell Gyre, confirming the hypothesis that two cyclonic circulation zones exist in the gyre. (Auth.)

J-44646

Antipov, N.N., Guretskiĭ, V.V., Danilov, A.I., Malek, V.N., **Water structure of the eastern portion of the Weddell Gyre in summer 1988** [Struktura vod v vostochnoi chasti krugovorota Ueddella letom 1988 g.], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.60-75, In Russian with English summary. 6 refs.

Results of the R/V *Professor Vize* expedition to the eastern area of the Weddell Gyre in Feb. 1988 are discussed. The contribution of warm circumpolar deep water from the southern periphery of the Antarctic Circumpolar Current into the Weddell Gyre (Weddell warm counterflow) is formed by the abrupt shift of the Circumpolar Current southeast of 20E, due to the large scale bottom topography. The Weddell warm countercurrent involves a water layer with maximum temperatures below 1.6 C, and 500-600 km wide. The eastern boundary of the Weddell Gyre, which divides waters involved in the Gyre from those participating in the circumpolar movement, lies near 26-30E. (Auth.)

J-44647

Guretskiĭ, V.V., Danilov, A.I., **Spatial structure of the frontal zone of eastern Weddell Gyre in summer 1988** [Prostranstvennaia struktura frontal'noi zony v vostochnoi chasti krugovorota Ueddella letom 1988 g.], Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.75-86, In Russian with English summary. 7 refs.

The thermohaline water structure was studied in the area which divides the Weddell Gyre and the circumpolar movement (the eastern boundary of the Weddell Gyre). It was established that the water's spatial structure is characterized primarily by eddying associated with maximum gradients of hydrophysical and hydrochemical parameters and the highest geostrophic speeds. Synoptic structures of two types were distinguished. The first type was composed of warm rings which developed at the Antarctic Polar Front and were observed east of 25E. The second type consisted of eddies genetically associated with the frontal zone which divides circumpolar waters and the Weddell Sea deep waters. (Auth. mod.)

J-44648

Danilov, A.I., Drygina, I.A., Malek, V.N., **Thermohaline water structure in the South Sandwich Trench area** [Termokhalinnaia struktura vod v raione IUzhno-Sandvicheva zhelobaj, Issledovaniia Ueddellovskogo krugovorota. Okeanograficheskie usloviia i osobennosti razvitiia planktonnykh soobshchestv. (Investigations of the Weddell Gyre. Oceanographic conditions and features of the development of plankton communities). Edited by E.V. Soliankin, A.I. Danilov, and R.R. Makarov, Moscow, VNIRO, 1990, p.86-98, In Russian with English summary. 3 refs.

The oceanographic survey carried out in Dec. 1987 near the South Sandwich Trench showed cyclonic and anticyclonic meanders generated by the bottom topography to be the essential element of the large-scale thermohaline structure and circulation. Their boundary

was the frontal zone associated with the South Sandwich Trench, which divides waters from the Weddell Sea and circumpolar deep water. The cold cyclonic inflow from the Weddell Sea practically cuts off the southern position of the anticyclonic meander from "mother" waters. The observed phenomenon demonstrates the ed-dying meridional exchange between the Weddell Gyre and the southern periphery of the Antarctic Circumpolar Current. (Auth.)

J-44656

Cripps, G.C., Priddle, J., **Hydrocarbons in the antarctic marine environment**, *Antarctic science*, Sep. 1991 3(3), p.233-250, Refs. p.247-250.

The antarctic marine ecosystem contains low concentrations of a range of hydrocarbons, overwhelmingly biogenic in origin. The low natural levels of hydrocarbons and the small amount of local human activity make the antarctic marine ecosystem suitable as a yardstick against which future global pollution by hydrocarbons can be assessed. At present, contamination is very low and difficult to resolve against the background. Local pollution is restricted to a very few events. A systematic program with a clear definition of the natural background is proposed to monitor both global and local pollution. (Auth.)

J-44694

U.S. National Science Foundation, **Antarctic journal of the United States**, Vol.25, No.4, Washington, D.C., 1990, 23p.

Although the United States and New Zealand have moved the headquarters for their antarctic programs to the newly opened International Antarctic Center near Christchurch International Airport, oil spills provided the most news for this issue. Details are given on the organization of the effort to contain and clean up the spill from *Bahia Paraiso* near Palmer Station and the effects of fuel storage leaks at Williams Field and at Amundsen-Scott. Some changes in the Antarctic Treaty System resulted from Ecuador and The Netherlands gaining consultative status, which, together with the unification of Germany, brings to 26 the number of consultative parties; Switzerland acceded to the Treaty which increases the number of acceding nations to 13. A long term ecological program has begun near Palmer Station as an element in a program which has 17 other sites in operation in the United States. The objective is to help researchers identify rare events, cyclical ecological processes, and long-term trends. Four young scholars are joining antarctic field teams to learn about Antarctica and how research is done there. A listing is given of funding awards for the period July 1 through Sep. 30, 1990, and weather summaries for McMurdo, Palmer, and Amundsen-Scott Stations for Aug., Sept., and Oct. 1990 are provided.

J-44725

Kennett, J.P., Stott, L.D., **Abrupt deep sea warming, palaeoceanographic changes and benthic extinctions at the end of the Palaeocene**, *Nature*, Sep. 19, 1991 353(6341), p.225-229, 56 refs.

A remarkable oxygen and carbon isotope excursion occurred in antarctic waters near the end of the Palaeocene (about 57.33 Myr ago), indicating rapid global warming and oceanographic changes that caused one of the largest deep-sea benthic extinctions of the past 90 million years. In contrast, the oceanic plankton were largely unaffected, implying a decoupling of the deep and shallow ecosystems. The data suggest that for a few thousand years, ocean circulation underwent fundamental changes producing a transient state that, although brief, had long-term effects on environmental and biotic evolution. (Auth.)

J-44727

Wells, M.L., Mayer, L.M., Donard, O.F.X., De Souza Sierra, M.M., Ackelson, S.G., **Photolysis of colloidal iron in the oceans**, *Nature*, Sep. 19, 1991 353(6341), p.248-250, 20 refs.

The extent to which iron limits primary production in open ocean waters depends not only on the aeolian supply, but also on factors that control its availability for biological uptake. Light increases the lability of colloidal iron in sea water of pH 8, with a photon-normalized spectral dependence that generally increases with decreasing wavelength from 400-300 nm. Optical modelling predicts that the incident solar spectrum, combined with the preferential attenuation of shorter ultraviolet wavelengths in sea water, will lead to a maximum depth-integrated photoreaction near 380-400 nm. Results show that the photolysis of forms of solid iron may occur deep into the ocean's euphotic zone, and hence that the availability of iron to phytoplankton in the ocean may be much greater than previously thought. One of the areas from which water samples used in this study were taken is the eastern margin of the Weddell Sea. (Auth. mod.)

J-44728

Anderson, L.G., Holby, O., Lindegren, R., Ohlson, M., **Transport of anthropogenic carbon dioxide into the Weddell Sea**, *Journal of geophysical research*, Sep. 15, 1991 96(C9), p.16,679-16,687, 21 refs.

Total carbonate data from the southern Weddell Sea, collected during the Swedish Antarctic Expedition in 1988-1989, has been investigated with respect to its content of anthropogenic carbon dioxide. The measured data was corrected for decay of organic matter by the use of the apparent oxygen utilization and the ratio of carbon to oxygen in organic matter. Correction due to precipitation or dissolution of metal carbonate was not found to be necessary from alkalinity and calcium data. With a combination of the water mass mixing conditions and the atmosphere-ocean carbon dioxide exchange, the anthropogenic input of carbon dioxide has been estimated. The anthropogenic carbon dioxide mean concentration varies in the different water masses as a result of the mixing conditions, from about 36 micro mol/kg in the Ice Shelf Water to 8 micro mol/kg in the Antarctic Bottom Water. The data were combined with oceanographic information in order to elucidate the ventilation of carbon dioxide in the Weddell Sea. With the outflow of Ice Shelf Water from the Filchner Depression equal to 700,000 cu m/s, the annual transport of anthropogenic carbon amounts to 8 trillion g for this special area. There are indications of other areas with significant deep water formation, but it is unlikely for these to add more than 2 times that of the Filchner Depression. This results in a total sequestering in the Weddell Sea of less than 1% of the annual anthropogenic emission of about 5.5 Gt C. (Auth. mod.)

J-44730

Whitworth, T., III, Nowlin, W.D., Jr., Pillsbury, R.D., Moore, M.I., Weiss, R.F., **Observations of the Antarctic Circumpolar Current and deep boundary current in the Southwest Atlantic**, *Journal of geophysical research*, Aug. 15, 1991 96(C8), p.15,105-15,118, 29 refs.

Fourteen-month velocity and temperature records from an array of 14 moorings north and west of the Falkland Plateau and supporting hydrographic and tracer data reveal a narrow boundary current that carries dense antarctic waters. The current flows west along the northern flank of the Falkland Plateau with mean speeds of more than 10 cm/s at 5000 m and more than 30 cm/s at 2500 m. The westward flow extends from the bottom to at least 1000 m, but the upper portion of the current is a branch of the Antarctic Circumpolar Current (ACC) following the only deepwater route between the Scotia Sea and the Argentine Basin. Waters colder than 0.2 C are too cold to be associated with the ACC at Drake Passage and must ultimately derive from the Weddell Sea as part of the deep thermohaline circulation.

The westward transport of water colder than 0.2 C is 8,200,000 cu m/s. In the mean the bottom boundary current is similar to that predicted by the Stommel-Arons model, but considerable variability is introduced by the meandering of the overlying ACC. Chlorofluorocarbon data suggest that new antarctic water from the Georgia Basin enters the Argentine Basin via the deep boundary current, which passes beneath the ACC; some new water is also advected east after being entrained in the ACC. (Auth. mod.)

J-44732

Rau, G.H., Takahashi, T., Des Marais, D.J., Sullivan, C.W., **Particulate organic matter delta C-13 variations across the Drake Passage**, *Journal of geophysical research*, Aug. 15, 1991 96(C8), p.15,131-15,135, 21 refs.

A 7 per mill gradient in the delta C-13 of suspended particulate organic matter (POM) was observed in samples taken during two transects across the Drake Passage during Mar. 1986. This POM delta C-13 transition from -23.2 per mill at 53.3S to values as low as -30.3 per mill at >62S does not track previously reported abrupt changes in water chemistry and plankton species composition associated with the Polar Front Zone that resides at approximately 58S in this region. Also, the north-south isotopic trend is not accompanied by significant changes in POM carbon or nitrogen concentrations, or in POM C/N. Differences in plankton standing crop or biochemistry (e.g., lipid content) therefore do not appear responsible for the isotopic trends observed. The latitudinal change in POM delta C-13 is, however, highly correlated with water temperature and with the calculated concentration of CO₂ (aq) at equilibrium with atmospheric CO₂. These observations are consistent with the hypothesis that [CO₂ (aq)] significantly influences POM delta C-13 in ocean surface waters. (Auth.)

J-44777

Visconti, G., **Global warming expected from increase of greenhouse gases: a forcing for sea level change**, Glacial isostasy, sea-level and mantle rheology. Edited by R. Sabadini, K. Lambeck, E. Boschi, Dordrecht, Kluwer Academic Publishers, 1990, p.203-212, 23 refs.

Global warming and related climatic changes expected from increase of the concentration of greenhouse gases may produce a redistribution of ice and water reservoir and consequently will affect the sea level. Direct warming may also affect sea level through thermal expansion. In this paper the model calculations on future sea level changes and interpretation of past data are reviewed. Changes in the volume and mass balance of the antarctic ice sheet are discussed. Data on global water mass distribution, as well as evaporation, precipitation and runoff for main water storage also includes Antarctica. The most interesting results so far seem to indicate that sea level rise has a regional character with different regions showing quite different trends. These model calculations however show some limitation because they do not consider the changes in ocean circulation produced by changes in the intensity of the wind stress field or salinity due to the changing climate. These changes may be of the same magnitude as those produced by thermal expansion or melting of mountain glaciers, and may appear on a relatively short time scale (10 years). The regional dependence of the sea level rise and the short time scale associated with circulation changes may introduce an additional noise source in analyzing past and future data. (Auth. mod.)

J-44778

Nakiboglu, S.M., Lambeck, K., **Secular sea-level change**, Glacial isostasy, sea-level and mantle rheology. Edited by R. Sabadini, K. Lambeck, E. Boschi, Dordrecht, Kluwer Academic Publishers, 1990, p.237-258, 32 refs.

Sea-level change as recorded by tide gauges exhibits a complex spatial and temporal variability for a number of reasons, including

tectonic movements of changes in ocean volume and the adjustment of the crust to major Late Pleistocene deglaciation, and to recent mountain glacier and antarctic melting. Tide gauge records have been analyzed by least squares regression for secular trends and mean regional trends have been estimated for 10 deg x 10 deg areas. These have been expanded into a surface spherical harmonic series, yielding the global long wavelength pattern of sea-level change. The low degree terms in this expansion represent a combination of tectonic change and local or regional changes in sea-level. The eustatic rise, reflecting a change in water volume and corresponding to the zero degree harmonic, is estimated as 1.15 +/- 0.38 mm/year. The first degree terms in the expansion are negligibly small, indicating that there is no significant shift in the center of mass of the ocean relative to the solid Earth. Of the second degree terms only the zonal coefficient is significant with an equatorial sea-level rise and a polar sea-level drop. The contributions from recent changes in mountain glacier volumes and postglacial rebound to the spatial variability are significant but not for the very low degree terms. The separation of these contributions from the observed change yields a globally averaged secular steric change of about 0.5 mm/year, but the uncertainties are large. The mainly zonal geometry of the steric change implies greater thermal expansion effects in low latitudes than in high latitudes. (Auth.)

J-44853

Melles, M., **Late Quaternary paleoglaciology and paleoceanography at the continental margin of the southern Weddell Sea, Antarctica** [Paläoglazologie und Paläozeanographie im Spätquartär am Kontinentalrand des südlichen Weddellmeeres, Antarktis], *Berichte zur Polarforschung*, 1991 No.81, 190p., In German with English summary. Refs. p.124-134.

During four expeditions with RV *Polarstern* at the continental margin of the southern Weddell Sea, profiling and geological sampling were carried out. A detailed bathymetric map was constructed from echo-sounding data. Sub-bottom profiles, classified into nine echotypes, have been mapped and interpreted. Sedimentological analyses were carried out on 32 undisturbed box grab surface samples, as well as on sediment cores from 9 sites. The following characteristics were determined: grain-size distributions; carbonate and C-org content; component distributions in different grain-size fractions; stable oxygen and carbon isotopes in planktic and benthic foraminifers; and physical properties. The stratigraphy is based on C-14 dating, oxygen isotope stages, on paleomagnetic measurements, and Th-230 analyses. The sediments represent the period of deposition from the last glacial maximum until recent time. They are composed predominantly of terrigenous components. The formation of the sediments was controlled by glaciological, hydrographical and gravitational processes. Variations in the sea-ice coverage influenced biogenic production. The ice sheet and icebergs were important media for sediment transport; their grounding caused compaction and erosion of glacial marine sediments on the outer continental shelf. The circulation and the physical and chemical properties of the water masses controlled the transport of fine-grained material, biogenic production and its preservation. Gravitational transport processes were the main mode of sediment movements on the continental slope. (Auth. mod.)

J-44855

Westerlund, S., Öhman, P., **Cadmium, copper, cobalt, nickel, lead, and zinc in the water column of the Weddell Sea, Antarctica**, *Geochimica et cosmochimica acta*, Aug. 1991 55(8), p.2127-2146, 35 refs.

This paper presents results from the first complete investigation of the dissolved and suspended trace metals cadmium, copper, cobalt, nickel, lead, and zinc in the water column of the Weddell Sea. Thirty-five stations were occupied in the central Weddell Sea and the

shelf areas around the Filchner depression and Dronning Maud Land. Snow samples were collected from the sea ice and from the antarctic continent to evaluate the importance of the fresh water influence on the Weddell Sea. Oceanographic data, i.e., salinity, temperature, and nutrients, are used to link the trace metal results to the different water masses. The general range found is for cadmium, 0.5-0.8 nM; copper, 2.0-2.9 nM; cobalt, 20-40 nM; nickel, 6-7 nM; lead, 10 pM; zinc, 3-7 nM. The suspended trace metals are a small fraction, but considerably higher than in other oceans. The lowest concentrations of cadmium, copper, and zinc are found in the surface layer and in the whole water column at the Filchner Depression. Cobalt shows an increase in the surface water compared to the deep water. This is suggested to be generated by the terrigenous material from the antarctic continent from the melting of the ice. No evidence of anthropogenic lead can be seen in the lead profile. Nutrient trace metal relations found show poor statistical correlation in contrast to what is found in other oceans. This assumes that cadmium, copper, and zinc are not directly linked to the bioproduction cycle. However, the nutrient trace metal ratios found support the theory that the Weddell Sea is the ultimate source for generation of the nutrient trace metal ratios in the Pacific Ocean. (Auth.)

J-44868

Broecker, W.S., **Comment on "Iron deficiency limits phytoplankton growth in antarctic waters" by John H. Martin et al**, *Global biogeochemical cycles*, Mar. 1990 4(1), p.3-4, 1 ref. For article referred to see J-44869.

The comment on the article by J.H. Martin, referred to in the title and appearing in this issue, centers on the following: while Martin's discovery that the addition of very small amounts of iron to nutrient rich surface water enhances NO₃ uptake rates and chlorophyll standing crops is to be considered interesting and important, the author of this comment does not see it as a realistic way to slow the buildup of fossil fuel CO₂ in the atmosphere.

J-44869

Martin, J.H., Fitzwater, S.E., Gordon, R.M., **Iron deficiency limits phytoplankton growth in antarctic waters**, *Global biogeochemical cycles*, Mar. 1990 4(1), p.5-12, 20 refs.

Enrichment experiments were performed in the Ross Sea to test the hypothesis that iron deficiency is responsible for the phytoplankton's failure to use up the luxuriant major nutrient supplies found in these and all other offshore antarctic ocean waters. Nitrate uptake rates in the controls without added trace elements ranged from 0.58 to 1.22 micro-mol/kg/d; the addition of 1 to 5 nmol of unchelated Fe/l resulted in rates that were 2 to 10 times higher. Rates in bottles with 2 nmol Mn added were identical to those in the controls. Total decreases in NO₃ were balanced by increases in particulate organic N. These results suggest that Fe deficiency is the primary reason that the present-day southern ocean biological pump is shut off. In contrast, iron was 50 times more abundant during the last glacial maximum; greater Fe availability may have stimulated the biological pump and contributed to the ice age drawdown of atmospheric CO₂. These results also imply that large-scale southern ocean Fe fertilization is feasible, at least in terms of the total amounts of Fe required; i.e., 100,000 to 500,000 tons/yr. (Auth. mod.)

J-44870

Dugdale, R.C., Wilkerson, F.P., **Iron addition experiments in the Antarctic: a reanalysis**, *Global biogeochemical cycles*, Mar. 1990 4(1), p.13-19, 16 refs.

In an accompanying paper, Martin et al. [this issue] interpret the results of four iron enrichment experiments using antarctic seawater to indicate iron limitation of phytoplankton growth and nitrate uptake, and suggest that Fe additions may contribute to reducing atmospheric CO₂ and the greenhouse problem. A published review [Dugdale and Wilkerson, 1989] of nitrogen uptake measurements

using N-15 in antarctic waters, and the nitrate depletion data of Martin et al. reported as absolute uptake rates, are analyzed in the context of previous investigations by converting the data to nitrogen-specific uptake rates (V, in reciprocal time units). It is concluded that Fe addition to the enclosed water does not affect the algal growth terms due to nitrate uptake per se, but apparently influences loss terms, enabling phytoplankton biomass to accumulate in the experimental bottles. (Auth. mod.)

J-44871

Dehairs, F., **On suspended barite and the oxygen minimum in the southern ocean**, *Global biogeochemical cycles*, Mar. 1990 4(1), p.85-102, Refs. p.100-101.

Particulate Ba profiles were measured in the Indian sector of the southern ocean. The largest fraction (>80%) of this barium is present as barite microcrystals. The profiles of total barium are characterized by a subsurface maximum between 200 and 500 m depth in the vicinity of the oxygen minimum. Highest barium values are found just south of the Polar Front, while lowest values occur close to the Antarctic Divergence. Between the divergence and the Polar Front a tight inverse relationship is observed between oxygen in the oxygen minimum and barium in the barium maximum. This relationship disappears north of the Polar Front. Since suspended barite is known to be of biological origin, the correlation of barite with oxygen suggests that the observed decrease of oxygen in the oxygen minimum, between the Divergence and the Polar Front, is due to local consumption of oxygen. It is proposed that deep low-oxygen water is advected towards the Divergence where upwelling occurs and where this water subsequently partly spreads out to the north-northeast, as entrained by the Antarctic Circumpolar Current. (Auth.)

J-44901

Roese, M., Gallo, J.F., Walter, M., Farenga, M., **Temperature circulation and distribution in McFarlane Strait and Moon Bay, South Shetland Is.** [Circulación y distribución de temperatura en el estrecho McFarlane y bahía Luna, islas Shetland del Sur, Antártida], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1991 No.402, 26p., In Spanish with English, German and French summaries. 10 refs.

Hydrologic data obtained in the McFarlane Strait and Moon Bay during the summers of 1988-1990 are presented. These data were analyzed to determine circulation patterns in function of the wind and tide regimes, and to identify the correlation of the thermic field with the dynamics of the region. For winds less than 2 m/s, the body of water responds slightly to the tide action, affected by the bottom topography and with the existence of an important residual current. From Lagrangian data and the form of surface isotherms, the existence of a dominating mean current, entering from the Bransfield Strait, is inferred. This generates an anticyclonic recirculation around Half Moon I. and a cyclonic recirculation in the northern sector of Moon Bay. Between 250 m and the bottom, a temperature inversion is noted, caused by the mixing with more temperate water masses coming from the Bellingshausen Sea. With winds of more than 2 m/s, an influence on the circulation, reflected in the thermic homogeneity of the column, is detected. (Auth. mod.)

J-44946

Huntley, M., Karl, D.M., Nöller, P., Holm-Hansen, O., **Research on Antarctic Coastal Ecosystem Rates (RACER): an interdisciplinary field experiment**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.911-941, Refs. p.936-941.

The Research on Antarctic Coastal Ecosystem Rates (RACER) program of 1986-87 was designed to examine physical and biological processes that give rise to high biological productivity in the vicinity of the Antarctic Peninsula. In a 25,000 sq km sampling area at the

western end of Bransfield Strait and during the period from mid-Dec. 1986 to late Mar. 1987, four 2-week cruises were made over a 69-station grid encompassing the coastal shelf, the continental shelf break, numerous island shelves, the Bellingshausen Sea-Weddell Sea confluence, and a portion of Drake Passage. Studies were focused on the upper ocean (0-200 m) and included detailed measurements of hydrography, ocean optics, vertical flux, and the distribution, abundance and productivity of bacteria, phytoplankton, zooplankton and krill. This paper describes the program logistics and presents the results of a carbon flux model, based on empirical observations, for the nearshore pelagic marine ecosystem. (Auth.)

J-44947

Niiler, P.P., Amos, A., Hu, J.H., **Water masses and 200 m relative geostrophic circulation in the western Bransfield Strait region**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.943-959, 5 refs.

Four hydrographic surveys to 200 db of 16-20 nm horizontal resolution carried out in the vicinity of western Bransfield Strait in the period Nov. 1986 to Mar. 1987 are used to provide a description of water masses and relative geostrophic circulation in the survey area. The water mass structure is characterized by two frontal structures with a complex vertical and horizontal interleaving of water from the Southern Drake Passage, Orkney I. shelf, Bellingshausen Sea and the shelf of Antarctic Peninsula. In the northwestern segment of the survey area, intrusions of Drake Passage water into the Bransfield are found beneath a frontal zone at a 100 m depth between Snow and Smith Is. In the southeastern segment fresh, warm water from the Gerlache Straits flows over the cold salty water from the Antarctic Peninsula. A geostrophically balanced relative flow, termed the Bransfield Current, transports water along a second front between Bellingshausen Sea and Antarctic Peninsula from the Bellingshausen Sea and Gerlache Straits to the northeast. A cyclonic gyre exists around Low I. This circulation and diffusion could transport particles from the biologically rich Gerlache Strait to Livingston I. and the Drake Passage in 15-30 days, while particles can spread an average \pm 50 km to either side of a track traced out by the mean flow. (Auth. mod.)

J-44950

Mitchell, B.G., Holm-Hansen, O., **Bio-optical properties of Antarctic Peninsula waters: differentiation from temperate ocean models**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1009-1028, Refs. p.1027-1028.

An extensive biological and optical data set was collected during a 4 month cruise as part of the RACER program conducted in coastal waters of the Antarctic Peninsula and adjacent open ocean waters of Drake Passage. Chlorophyll plus phaeopigment (Chl + Phaeo) concentration in the upper mixed layer ranged 2 orders of magnitude from 0.5 to 50 mg Chl + Phaeo/cu m during the study. The large variations in pigment correspond to variations in the beam attenuation coefficient at 660 nm (ct) ranging from 0.5 to >2.5 /m and in the diffuse attenuation coefficient (kd) for 441 nm ranging from 0.04 to >1.0 /m. Chl + Phaeo specific particulate beam attenuation and spectral absorption coefficients suggest that detrital contributions are relatively low and that pigment package effects are relatively important compared to low latitude observations. The combination of these effects causes low pigment specific absorption and scattering. This regional differentiation in particulate optical properties has a significant effect on models of the relationships between Chl + Phaeo and spectral values of kd and upwelled radiance (Lu). Implications of these effects for modeling light propagation through the water column and for remote sensing of phytoplankton pigments are discussed. (Auth.)

J-44952

Bird, D.F., Karl, D.M., **Spatial patterns of glutamate and thymidine assimilation in Bransfield Strait, Antarctica during and following the austral spring bloom**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1057-1075, Refs. p.1074-1075.

Extensive temporal and spatial measurements of microheterotrophic metabolism obtained during the RACER program were used to determine the importance of biological and physical characteristics of the water to microbial rates *in situ*. During the 4-month sampling period, the rate of [3 H]-thymidine incorporation into macromolecules ranged two orders of magnitude over the RACER study area; [3 H]-glutamate incorporation varied 170-fold. The highest mean values and greatest spatial variation in microheterotrophic activity occurred in Jan., during the decline of the seasonal phytoplankton bloom. Examination of relationships among hydrographic and biological variables was carried out through a study of spatial autocorrelation structure. Low-order positive, and high-order negative autocorrelations were associated with a gradient in biological activity, from maxima in the northern Gerlache Strait to minima in Drake Passage. Evidence was found that the temperature history of a site had a stronger bearing on production than did contemporaneously measured temperature. The strength of interactions between microheterotrophs and other plankton components varied with time. The relationships that held during the phytoplankton bloom (Dec.) were strengthened and modified during the period of most intensive microheterotroph activity (Jan.), and then collapsed and were replaced by other relationships in late summer (Mar.) when microheterotrophic activity was low throughout the study area. (Auth. mod.)

J-44953

Bailiff, M.D., Karl, D.M., **Dissolved and particulate DNA dynamics during a spring bloom in the Antarctic Peninsula region, 1986-87**, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1077-1095, Refs. p.1094-1095.

Dissolved and particulate DNA (D-DNA and P-DNA, respectively) concentrations were measured at 69 stations in a 25,000 sq km section of Bransfield Strait, during Dec. 1986 to Mar. 1987. During the development of the seasonal spring bloom of phytoplankton (Dec. and Jan.), surface water P-DNA (0.2-202 microns) exhibited an order-of-magnitude concentration gradient, from values of >25 micrograms DNA/l in the productive coastal waters near the northern end of Gerlache Strait to <4 micrograms DNA/l in the more oligotrophic waters of Drake Passage. P-DNA concentrations were highly correlated with other biochemical indices of microbial biomass (e.g. chlorophyll *a* and ATP). A majority of the P-DNA was contained in the 0.2-20 micron size category. Estimates derived from DNA:ATP ratios and from direct measurements of bacterial cell abundance suggest that most of the P-DNA during the spring bloom period was associated with living phytoplankton cells, with little, if any, non-living P-DNA. In contrast to these characteristics of the spring bloom period, P-DNA during post-bloom conditions (Mar.) was low (4-6 micrograms DNA/l) and nearly constant throughout the study area, was nearly exclusively ($>80\%$) contained in the 0.2-20 micron size category, and was nearly exclusively ($>90\%$) comprised of non-living DNA. D-DNA was ubiquitously distributed in the near-surface waters throughout the RACER study area in Dec., with concentrations ranging from 6 to 16 micrograms DNA/l. The results of a box model calculation of P-DNA and D-DNA inventories and fluxes in Bransfield Strait suggest that the northern Gerlache Strait is a major exporter of P-DNA, either as a result of horizontal advection or active transport of macrozooplankton populations. (Auth. mod.)

J-44954

Karl, D.M., Tilbrook, B.D., Tien, G., **Seasonal coupling of organic matter production and particle flux in the western Bransfield Strait, Antarctica, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1097-1126, Refs. p.1122-1126.**

Simultaneous measurements of seasonal depletions in dissolved inorganic carbon (Sigma CO₂), nitrogen and phosphate and concentrations of C, N and P collected using sediment traps at 5 representative sites in a 25,000 sq km sector of the western Bransfield Strait over a 4 month period, have allowed the authors to evaluate the coupling between primary production and particle flux. During the spring bloom period, an average C:N:P ratio of 158:15.6:1 sq km was observed. These C:N (and C:P) ratios are higher than the expected Redfield ratios and also exceed the C:N and C:P ratios directly measured for suspended and sinking particles. A coupled formation of carbon-rich dissolved organic matter is hypothesized as a sink for approximately 30-50% of the Sigma CO₂ removed during net photosynthesis. The rapid production and accumulation of phytoplankton in the northern portion of Gerlache Strait during the spring bloom resulted in a substantial pCO₂ undersaturation compared to surface samples collected from lower productivity areas in Drake Passage. Nevertheless, CO₂ invasion from the atmosphere was minimal, in part due to the fact that there was little or no wind-driven mixing at this time of the year. Particulate C, N, P and ATP fluxes, derived from free-floating sediment traps, revealed a substantial variability in time and space. The greatest seasonal variation occurred at the stations with the highest rates of primary production. For the northern Gerlache Strait station, new production was 26% of total production during the Dec. to Jan. spring bloom period. (Auth. mod.)

J-44955

Leventer, A., **Sediment trap diatom assemblages from the northern Antarctic Peninsula region, *Deep-sea research*, Aug.-Sep. 1991 38(8-9A), p.1127-1143, Refs. p.1141-1143.**

Quantitative floral analyses were performed on 29 samples collected at 5 sites in the northern Antarctic Peninsula region during Dec. 1986 to Mar. 1987. At 3 of the 5 sites, absolute diatom flux decreased by more than an order of magnitude from Jan. to Feb., the result of the sinking of bloom populations and subsequent decreased levels of primary productivity. These data indicate that at least to 200 m, grazing and pelletization did not obscure the primary signal. Relatively low and uniform diatom flux in Drake Passage was indicative of a deeply mixed surface layer in which peak levels of biomass could not accumulate. The utility of diatoms as water mass tracers is demonstrated by the distribution of 3 floral assemblages, both in the sediment traps and surface sediment samples. A distinct circumpolar assemblage dominated by *Nitzschia kerguelensis* was observed in Drake Passage. A diatom assemblage comprised of moderate to high abundances of *Chaetoceros* resting spores, *Nitzschia curta*, and *Thalassiosira antarctica* was broadly distributed through Bransfield Strait and Livingston I. continental shelf. Diatom flux in Gerlache Strait was dominated by resting spores of *Chaetoceros*. Northeastward advection distributed these spores into Bransfield Strait where high *Chaetoceros* fluxes were observed at depth. Chemical data suggest the possibility that spore formation resulted from nutrient depletion. In neritic antarctic waters, significant production and mass sinking of resting spores appears to be characteristic of the final stages of an intense phytoplankton bloom. (Auth. mod.)

J-45001

Mazzullo, E.K., ed, **Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic**, College Station, TX, Texas A and M University, 1991, 826p.

DLC QE39.T49b Vol.114, 1987

The volume comprises 41 papers dealing with interpretive evidence gathered from the earth beneath the ocean to enhance under-

standing of the planet as a whole. Most of the gathering time was passed while combating 40-50 ft seas and 50 kt winds. Leg 114 encompasses drill sites 698 through 702 which lie at about 51S between 20 and 35W, and sites 703-704 located at about 47S, 8E. Topics reported and discussed include tectonics and geophysics (3 papers); stratigraphy and micropaleontology (15 papers); paleomagnetism (4); isotopes and paleoceanography (8); sedimentology (3); physical properties and diagenetics (5); and interstitial waters and geochemistry (2). There is also one data report, a section of corrections for Vol.110 and Vol.113, and a policy section which identifies members of various ODP panels and committees, and provides a sample distribution policy guide. Subject and paleontological indexes close the volume. Tables 3, 4, 5, and 6 for paper (chapter) 12 are enclosed in a back pocket.

J-45005

Ciesielski, P.F., **Biostratigraphy of diverse silicoflagellate assemblages from the Early Paleocene to Early Miocene of Holes 698A, 700B, 702B, and 703A: subantarctic South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.49-96, 58 refs.

DLC QE39.T49b Vol.114 1987

Nearly complete Paleogene sedimentary sequences were recovered by Leg 114 to the subantarctic South Atlantic. Silicoflagellate assemblages from the Paleogene and immediately overlying lower Neogene from Sites 698 (Northeast Georgia Rise), 700 (East Georgia Basin), 702 (Islas Orcadas Rise), and 703 (Meteor Rise) were examined. The described assemblage from Hole 700B represents the most complete yet described from the Paleocene, encompassing planktonic foraminifer Zones Plb (upper part) through P4 and Subchrons C25N to C23N. All lower Eocene sediments are barren as a result of diagenesis, except for a single sample from Hole 698A. Middle Eocene silicoflagellates described from the Hole 702B range in age from early middle Eocene (P10) to late Eocene (P15), with correlations to Subchrons C21N to C18N. Hole 703A contains late Eocene through early Miocene assemblages, with paleomagnetic control from Subchrons C16R to C6AAN. Leg 114 biosiliceous sequences contain exceptionally diverse assemblages of silicoflagellates. Approximately 155 species and separate morphotypes are described from the Paleogene and earliest Neogene, including 15 new species and 4 taxonomic revisions of previously described species. Sixteen silicoflagellate zones and subzones are recognized for this interval which extends from 63.2 to 22.5 Ma. (Auth. mod.)

J-45026

Müller, D.W., Hodell, D.A., Ciesielski, P.A., **Late Miocene to earliest Pliocene (9.8-4.5 Ma) paleoceanography of the subantarctic southeast Atlantic: stable isotopic, sedimentologic, and microfossil evidence**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.459-474, 94 refs.

DLC QE39.T49b Vol.114 1987

During the late Miocene, between 9.8 and 6.4 Ma, carbonate content was high with little variability, with sustained productivity dominated by foraminifers and calcareous nannoplankton in surface waters north of the subantarctic front. Decreased carbonate (40%), along with first significant occurrence of biogenic opal, occurred between 8.45 and 8.2 Ma. The first signals of increased cooling occurred between 8.8 and 8.0 Ma. The interval from 6.3 to 4.5 Ma represents low carbonate values with high variability, suggesting markedly fluctuating conditions in the production and/or dissolution of carbonate. The onset of this interval in Hole 704B is marked by a decrease in carbonate values and a well-defined 0.85 per mill decrease in $\delta^{13}C$ -13 values of both planktonic and benthic foraminifers

between 6.4 and 6.0 Ma, correlated to the Chron C3AR (upper reversed of Chron 6) "carbon shift." The interval of the carbon shift (6.4 to 6.0 Ma) is characterized by decreasing $\delta^{18}\text{O}$ values, anomalously low $\delta^{18}\text{O}$ minima in planktonic foraminifers, and intervals dominated by temperate and low-latitude diatom and silicoflagellate assemblages, suggesting warm interglacial conditions with brief events of extreme warming or low salinity in the subantarctic South Atlantic. The benthic $\delta^{18}\text{O}$ record displays a strong glacial interval between 5.8 and 5.4 Ma, which is coincident with the time of a major increase in an upwelling diatom assemblage between 6.0 and 5.4 Ma. The earliest Gilbert Chron (5.35 to 4.77 Ma) was marked by an intense carbonate dissolution event and low surface productivity. (Auth. mod.)

J-45034

Westfall, F., Fenner, J., **Pliocene-Holocene polar front zone in the South Atlantic: changes in its position and sediment-accumulation rates from Holes 699A, 701C, and 704B**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.609-646, 23 refs.

DLC QE39.T49b Vol.114 1987

Sites 699 and 704 come under the influence of the Antarctic Circumpolar Current (ACC) and Circumpolar Deep Water. It is possible that the upper reaches of Antarctic Bottom Water (AABW) may also affect Hole 699A. Site 701 is influenced by AABW. Closely spaced samples were analyzed for grain-size distribution, sand fraction components, biosiliceous microfossils, organic carbon, and water content. PFZ migrations are traced using changes in bulk sediment-accumulation rates and the abundance of the diatoms *Actiniscus* ssp. and Genus et species indet., as well as changes in sediment grain size and composition. Diatomaceous sediments of Gilbert age in Hole 699A indicate that the PFZ was positioned over this site, but during the Gauss it migrated north, bringing in less-productive Antarctic Surface Water. All cores document a very gradual southerly movement of the PFZ throughout the Matuyama. This regressive shift culminated in the late Matuyama. The corresponding interval in Hole 704B, the shallowest core, contains evidence of winnowing. Sharp fluctuations of large amplitude and high frequency in the lithology of the sediments from Hole 704B in the eastern South Atlantic, starting at about 0.75 m.y. and characterizing the whole Brunhes Epoch, record the rapid movement of the northern border of the PFZ over the site. These reflect strong glacial/interglacial alternations in climate. To a lesser extent, lithologic fluctuations in Hole 701C reflect the same phenomenon, whereas in Hole 699A the lithology does not vary as dramatically. (Auth. mod.)

J-45040

Froelich, P.N., Mortlock, R.A., Mefferd, M., Powers, J., **Interstitial-water chemistry: abyssal South Atlantic and East Georgia Basins, Islas Orcadas and Meteor Rises**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.719-731, 18 refs.

DLC QE39.T49b Vol.114 1987

Pore-water samples were recovered at five sites from ODP Leg 114 in the subantarctic South Atlantic Ocean and analyzed for pH, alkalinity, chloride, sulfate, fluoride, silica, magnesium, calcium, strontium, potassium, lithium, and barium. At sites in the East Georgia Basin and on the Islas Orcadas Rise, Ca increases and Mg decreases linearly downhole with a $\delta\text{Mg}/\delta\text{Ca}$ ratio reflecting conservative diffusive exchange and basalt basement reactions. At sites on the west flank of the Mid-Atlantic Ridge and on the Meteor Rise, Ca gradients are nonlinear, and nonconservative $\delta\text{Mg}/\delta\text{Ca}$ ratios reflect alteration reactions of abundant silicic volcanic ash

in the sediment. K decreases linearly downhole at all sites, reflecting uptake by basement and the absence of significant sediment-hosted reactions. SO_4 decreases and alkalinity increases downhole are due to a slight sulfate reduction at all sites except at Site 701. Sr increases downhole at all sites except Site 701, with $\delta\text{Sr}/\delta\text{Ca}$ ratios reflecting diffusive exchange with basement. At Site 704 on the Meteor Rise, there is intense Sr production during carbonate recrystallization in the upper 200 mbsf. Below 200 mbsf at Site 704, the ion concentration product of SrSO_4 is constant, suggesting Sr control by celestite solubility. Li and F concentrations display complex behavior related to sedimentary reactions, probably calcite recrystallization (Li uptake and F release). (Auth.)

See also:

A-44763 B-42886 B-42950 B-42952 B-42954 B-43002 B-43008 B-43009 B-43185 B-43189 B-43202 B-43203 B-43204 B-43205 B-43342 B-43379 B-43397 B-43399 B-43471 B-43478 B-43632 B-43655 B-43664 B-43823 B-43870 B-43871 B-43889 B-43931 B-43939 B-43945 B-44169 B-44307 B-44402 B-44405 B-44435 B-44439 B-44484 B-44527 B-44544 B-44576 B-44578 B-44586 B-44649 B-44650 B-44651 B-44653 B-44661 B-44700 B-44757 B-44790 B-44798 B-44799 B-44800 B-44802 B-44830 B-44848 B-44877 B-44948 B-44949 B-44951 B-44959 B-44960 B-44986 B-44987 B-44989 B-44991 B-45048 C-43363 C-43364 C-43650 C-43765 D-43107 E-43251 E-43672 E-43867 E-43879 E-44061 E-44063 E-44278 E-44367 E-44368 E-44369 E-44371 E-44372 E-44373 E-44374 E-44375 E-44482 E-44503 E-44505 E-44511 E-44756 E-44859 E-45012 E-45024 E-45025 E-45027 E-45029 E-45032 E-45037 F-42883 F-43181 F-43183 F-43348 F-43375 F-43387 F-43450 F-43472 F-43508 F-43635 F-43738 F-43880 F-44062 F-44079 F-44129 F-44282 F-44283 F-44295 F-44355 F-44357 F-44360 F-44361 F-44464 F-44525 F-44554 F-44567 F-44572 F-44613 F-44687 F-44774 F-44854 F-44984 G-43960 G-43961 G-44266 I-43023 I-43123 I-43246 I-43247 I-43736 I-43737 I-44463 I-44486 I-44735 I-44880 L-43110 L-43415 L-43878 L-44470 L-45021 M-43149

K. ATMOSPHERIC PHYSICS

K-42884

De Petris, M., **On the antarctic ozone depletion during solar cycle 21**, *Annales geophysicae*, Jul.-Aug. 1990 8(7-8), p.541-547, 26 refs.

The long-term variations of the ozone column density, observed in the antarctic atmosphere in the period 1964-1985, are studied in connection with the trend of the geomagnetic activity. While the current view accounts for the ozone depletion entirely in terms of chemical and dynamical processes occurring in the atmosphere, we show that the present experimental evidences rely favourably on the contribution of geomagnetic phenomena such as aurorae, induced by solar related disturbances. (Auth.)

K-42899

Yamagishi, H., **Development of optical disk data base system for Syowa Station-Iceland geomagnetically conjugate observation**, *Antarctic record*, July 1990 34(2), p.242-262, In Japanese with English summary. 5 refs.

Long-term monitoring of upper-atmosphere physics phenomena has been carried out at Showa Station-Iceland geomagnetically conjugate points since 1983, and this project will continue to cover at least 1 solar-activity cycle of 11 years. A great amount of digital data has been accumulated and is waiting for efficient data management; a database system was developed using the optical-disk technique. The function of the system comprises management of data storage, data display, and unloading of specified data. This report describes the basic concept of system design, system function, and operation. (Auth. mod.)

K-42996

Liu, C., Jiao, C., Zhang, P., **Analysis of diurnal variation of geomagnetic field observed at the Chinese Great Wall Station, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.241-249, 11 refs.

From studies carried out at the Great Wall Station (GWS) in Feb.-Mar. 1986 it is noted that the quiet daily variation of geomagnetic field (S_q) at GWS is similar to that of Beijing Station (BJS) in the middle latitude, but their disturbed daily variations (SD) are different. Amplitudes of the diurnal harmonic components in S_q and SD variations are larger than those of semidiurnal components at GWS. The equivalent current vector of S_q has twin opposite current vector patterns in daytime. They are similar to current pattern for S_q -field in polar cap, but the equivalent current vector of SD is almost the same in day and night times at GWS. Its current vector distribution is similar to the equivalent pattern of SD (D_{pl}) in the polar region. The variational range of Z component has the same level as that of H at GWS, but the diurnal variational range of Z is much larger than that at BJS. There is a correlation between the daily range in Z and the solar activity. Therefore, the diurnal variation of geomagnetic field is not only dominated by the S_q current system, but also by field-aligned current and westward (eastward) electrojet flowing in the polar region at GWS. (Auth. mod.)

K-43020

Ono, T., Hirasawa, T., Meng, C.I., **Faint auroras simultaneously observed by the monochromatic auroral TV on the ground and particle analyzers on board the DMSP satellite**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.417-425, 17 refs.

Faint auroral displays in the low latitude region of the duskside auroral oval were examined by using images from three monochromatic TV cameras at Showa Station, and simultaneous precipitating auroral particle data obtained by DMSP-F6 satellite. Auroral images were obtained by using image intensifiers and CCD detectors. Observation wavelengths were selected from the principal auroral emission lines such as 6300A (OI), 5577A (OI) and 4861A (H β) by using interference filters. The high sensitivity of the TV camera made it possible to observe faint auroral displays with high time resolution. The obtained image data were recorded by a PCM digital recording method. In addition the simultaneous auroral particle measurements were carried out by the DMSP-F6 satellite for electrons and ions with a time resolution of 1 second. The DMSP satellite data made it possible to examine precipitating electrons and protons in a wide energy range (30eV-30keV) with sufficient spectral resolutions (19 energy steps). (Auth. mod.)

K-43027

Nagata, T., **Summary of multidisciplinary research of auroral substorms at Syowa Station in Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.473-483, 7 refs.

In cooperation with the International Magnetosphere Study (IMS, 1976-78), and the Middle Atmosphere Program (MAP, 1982-85), observation programs at the lower magnetosphere altitudes and at the ionosphere and mesosphere altitudes have been performed regarding various phenomena associated with auroral substorms at Showa Station since 1976. Some typical results obtained from the routine ground-based observations, 520 IMS and MAP special programs, and new multidisciplinary research programs after MAP at Showa Station, are summarized.

K-43028

Sheldon, W.R., **Perturbations of the antarctic upper atmosphere by energetic electron precipitation**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.484-492, Refs. p.491-492.

Energetic electron precipitation in the vicinity of the Weddell Sea is one of the prominent features of the antarctic upper atmosphere. The substantial excess in electron precipitation there is caused by the minimum in geomagnetic field strength for the magnetic latitudes of this region. As a consequence, the mirror points of trapped electrons are lowered as they drift eastward through this range of longitudes, and a large fraction of outer belt electrons are precipitated in this locale. Models of electron precipitation which predict this effect are presented, along with satellite and ground-based data which appear to confirm their validity. The perturbations of the upper atmosphere which would result from this enhanced source of ionization are reviewed. Changes in the conductivity and chemical composition of the mesosphere caused by directly interacting electrons are described. Changes in the chemical composition of the mesosphere include en-

hancements in odd-nitrogen species during periods of increased electron precipitation. The subsequent effects on mesospheric ozone are described. (Auth. mod.)

K-43029

Cao, C., Wang, S., Xi, D., **Analysis of ionospheric data from 1986 to 1988 obtained at the Great Wall Station of China, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.492-499, 5 refs.

Ionospheric data from Mar. 1986 to Feb. 1988 obtained at the Great Wall Station are presented. Comparison of foF2 variation data with those from other antarctic stations shows that the foF2 changes above the Great Wall Station are characterized by the Weddell Sea Anomaly. On Mar. 2 and Oct. 31, the occurrence time of the maximum foF2 suddenly changed for about 12 hours. Seasonal variations of foF2 were much greater at night than in daytime. The mechanism of the Weddell Sea Anomaly is discussed. (Auth. mod.)

K-43030

Sato, N., Fujii, R., Saemundsson, T., **Conjugacy of pulsating auroras and their relation to geomagnetic pulsations**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.499-507, 8 refs.

Since 1983, simultaneous observations have been performed at geomagnetically conjugate stations: Showa Station in Antarctica and 3 stations in Iceland. The observations include optical auroral measurements by means of low light, all-sky TV cameras, all-sky cameras and photometers, as well as routine observations of magnetic fields and natural radio waves. Data on pulsating aurorae and geomagnetic pulsations analyzed show 3 types of relationships between the two: auroral luminosity changes, but the amplitude of magnetic pulsation is low; excellent correspondence of intensity variations between the two; and intensity variation of auroral and magnetic pulsation is very high but there is poor correlation between the two phenomena.

K-43031

Ono, T., Ejiri, M., Hirasawa, T., **Auroral emissions and particle precipitations observed by using the sounding rocket experiments at Syowa Station**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.507-513, 12 refs.

Sounding rocket experiments were carried out at Showa Station for the study of the relationship between auroral emissions and precipitating auroral particles. Three rocket payloads named AURORA I, II and III with the same instrumentation were launched by using Japanese sounding rockets S-310JA-8, -9 and 10 into the ionosphere at 3 different stages of auroral activities, up to a maximum height of 210 km. Results from AURORA II (stable aurora) showed moderate auroral activity, low emission intensity and low average energy of precipitating electrons. Compared to the AURORA II data, the AURORA I (active aurora) data showed higher auroral emission intensity and higher average energy. The AURORA III (diffuse aurora) data showed higher average energy in spite of low emission intensity. The energy spectrum of electrons from AURORA I and II exhibited inverted-V type spectra above discrete arcs, whereas AURORA III data showed power-law type spectra above diffuse auroras. (Auth. mod.)

K-43032

Sato, N., Saito, H., Saemundsson, T., **Pc 3-5 magnetic pulsation activities observed at Syowa-Iceland conjugate stations**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.514-520, 16 refs.

Preliminary results are reported on seasonal and diurnal variations in Pc 3-5 magnetic pulsation powers, obtained by using computer-compatible digital tape recorders. The simultaneous observation data used were obtained during a period of 2 years, beginning on Nov. 5, 1985, at Showa Station. The conjugate point of Showa is located halfway between Husafell and Tjörnes. The geomagnetic local time (MLT) is nearly the same as Universal Time (within 20 min) at the three stations. Magnetic pulsations were measured by induction magnetometer, and the power spectra of the pulsations were calculated using an autoregressive (AR) method. The present work reveals certain quantitative and statistical characteristics of Pc 3-5 magnetic pulsations at the conjugate stations.

K-43033

Ono, T., Ejiri, M., Hirasawa, T., **Monochromatic auroral imaging TV at Syowa Station**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.521-528 + tables, 17 refs.

A new TV camera was developed and applied to the auroral observation at Showa Station in 1984. The TV camera is to obtain monochromatic auroral images at the principal auroral emission lines. An important aspect of the new camera is digital recording of the observation data. Successive monochromatic auroral images transferred from the TV camera every few seconds are digitized and converted to digital data stream simultaneously and recorded by a high speed data recorder in a PCM format. Observations by using three sets of the TV cameras were carried out throughout the winter season in 1984 at Showa Station by the JARE-25 wintering party. The observed data were analyzed with two main purposes: to obtain the morphology of proton auroras in evening and morning sectors related to the electron auroras, and to see the dynamic behavior of auroras by using the high time and spatial resolutions of the TV camera. The observation of 6300Å aurora reveals that the effective lifetime of 6300Å auroral photoemission is about 50 sec. (Auth. mod.)

K-43035

Yamagishi, H., Sato, N., Kikuchi, T., **Small scale auroral absorption observed with scanning beam riometer at Syowa Station, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.534-540, 13 refs.

A new riometer of high spatial resolution, i.e., a scanning beam riometer, installed at Showa Station, is described. The ionospheric absorption within 60 km over Showa Station in geomagnetic north-south and east-west directions can be measured with a spatial resolution of 10 km and temporal resolution of 10 s. In this report, some typical auroral absorption events observed by the new instrument are studied with better spatial and temporal resolution than those of previous studies.

K-43069

Mikhailov, N.F., Ryzhkov, A.V., Shchukin, G.G., **Radiometeorological studies in marine conditions** [Radiometeorologicheskie issledovaniia nad morem], Leningrad, Gidrometeoizdat, 1990, 206p., In Russian. 143 refs.

This work discusses the propagation of UHF waves above the sea surface under different meteorological conditions in polar regions, including Antarctica. R-f propagation is examined, with consideration given to the interaction of microwave radiation, the atmosphere, and sea surface. The relationship between thermal microwave emission of the "atmosphere-sea" system near the horizon and microwave propagation characteristics is evaluated. The effects of propagation conditions on radar characteristics of the sea surface and radiometeorological properties of clouds and precipitation over the sea are discussed. (Auth. mod.)

K-43082

Sazhin, S.S., Smith, A.J., Sazhina, E.M., **Can magnetospheric electron temperature be inferred from whistler dispersion measurements**, *Annales geophysicae*, Apr. 1990 8(4), p.273-285, 27 refs.

An approximate expression for whistler-mode group velocity is obtained, taking into account the effects of electron temperature and anisotropy, density and ion effects, effects of oblique propagation and a non-dipolarity of the dayside magnetospheric magnetic field. This expression is applied to the propagation of whistlers between one hemisphere and the other. It is pointed out that at frequencies close to the upper cut-off of whistler spectra, perturbations to whistler group delay times due to temperature effects can be of the same order of magnitude as, or even higher than, the corresponding perturbations due to finite electron density and ion effects. A method of magnetospheric electron temperature diagnostics is proposed and applied to two whistlers recorded at Halley ($L=4.3$). It is pointed out that the values of temperature obtained from the analysis of whistler spectra depend on the choice of model of electron density and temperature distribution in the magnetosphere, and on the effect of ducted ray path on whistler delay times, which is difficult to take into account in the computations. (Auth.)

K-43108

Inan, U.S., **VLF heating of the lower ionosphere**, *Geophysical research letters*, May 1990 17(6), p.729-732, 11 refs.

A controlled wave-injection experiment with a 28.5 kHz transmitter having a radiated power of 100 kW has revealed evidence of ionospheric heating by the VLF waves. Calculations indicate that the observed effect can be attributed to the absorption of wave energy in the lower ionosphere, which is estimated to result in a 30% enhancement in the collision frequency at 85 km. This process also represents a new means of direct coupling of lightning energy to the lower ionosphere. A new finding is reported in which the amplitude of the 24.0 kHz NAA transmitter (Maine) signal observed at Palmer Station (PA), Antarctica exhibited the modulation pattern of the 28.5 kHz NAU transmitter (Aguadilla, Puerto Rico), which was being keyed as part of a controlled VLF wave-injection experiment. With the NAA-PA great-circle path crossing within <50 km of the ionosphere over the NAU transmitter, this result is interpreted as a VLF analog of the ionospheric cross-modulation effect. (Auth.)

K-43143

Hamar, D., Tarcsai, G., Lichtenberger, J., Smith, A.J., Yearby, K.H., **Fine structure of whistlers recorded digitally at Halley, Antarctica**, *Journal of atmospheric and terrestrial physics*, Sep. 1990 52(9), p.801-810, 13 refs.

Two whistlers recorded digitally at Halley ($L=4.3$) were analyzed by matched filtering with 10 Hz frequency resolution. For the construction of the matched filter, a more realistic description of the whistler waveform than has been used for lower latitude whistlers was applied. The (f,t) pairs obtained, together with the corresponding magnitudes, gave a resolution dynamic spectrum which revealed the fine structure of the whistlers. Whistlers which appeared as well defined discrete single traces on a conventional spectrogram turned out to be composed of several components covering various parts of the spectrum. Further analysis of the strongest and longest component of a whistler resulted in high resolution travel time residual curves similar to those obtained by the ray tracing method or by averaging of numerous occurrences of whistlers in the same duct. The matched filter method of analysis can provide new insights into the details of ducted whistler propagation. It also yields the amplitude variation vs time (or vs frequency) along the whistler trace, thus potentially giving information about the spectrum of the source spheric, and/or the frequency dependence of magnetospheric amplification due to wave-particle interactions. (Auth.)

K-43209

Vennerström, S., Friis-Christensen, E., Troshichev, O.A., Andresen, V.G., **Comparison between the polar cap index, PC, and the auroral electrojet indices AE, AL, and AU**, *Journal of geophysical research*, Jan. 1, 1991 96(A1), p.101-113, Refs. p.112-113.

The newly introduced index PC for magnetic activity in the polar cap has been examined to establish to what extent it can serve as an indicator of auroral electrojet activity. PC was derived for two stations, one in the Northern Hemisphere (Thule) and one in the Southern Hemisphere (Vostok). The simplicity of the PC index permits one to make a large data base for statistical investigations. Seven years of PC values were used for the two stations to analyze the relationship between PC and the auroral zone indices AE, AU, and AL statistically. A very high correlation is found between PC and AE during winter and equinox, the linear correlation coefficient being about 0.8-0.9 for Thule and about 0.7-0.8 for Vostok. During summer the correlation is less because the PC index is then disturbed by polar cap currents controlled by the northward and east-west components of the interplanetary magnetic field. It is concluded that PC can serve as a fast available indicator of DP 2 and DP 1 activity in the polar regions, excluding intrusions of the westward electrojet in the premidnight sector. (Auth. mod.)

K-43210

MacLennan, C.G., **Comparison of "Electrojet" indices from the Northern and Southern Hemispheres**, *Journal of geophysical research*, Jan. 1, 1991 96(A1), p.267-274, 18 refs.

A unique data set of digital and digitized analog magnetic recordings from 22 stations in the Antarctic was used to construct the Southern Hemisphere "equivalent" of the Northern Hemisphere auroral electrojet index, AE, for two separate intervals of magnetic disturbance (totaling seven days) in June 1982. A second index constructed using only 9 stations between 60-70 deg geomagnetic south latitude showed only small differences from that using all 22 stations. For the universal time interval (00-11 UT inclusive) when a reasonably good coverage of ground stations exists in the austral auroral zone, it is found that there is a good correlation between the Northern and Southern Hemisphere indices; this is the case even though the southern ionosphere is largely in total darkness during the interval studied. No effect of the north-south direction of the interplanetary magnetic field is found on the correlation. (Auth.)

K-43211

Smith, A.J., Carpenter, D.L., Corcuff, Y., Rash, J.P.S., Bering, E.A., **Longitudinal dependence of whistler and chorus characteristics observed on the ground near $L=4$** , *Journal of geophysical research*, Jan. 1, 1991 96(A1), p.275-284, Refs. p.283-284.

Whistler activity at $L=4$ is known to be a function of longitude, peaking in the Weddell Sea sector of Antarctica. To investigate if chorus and hiss activity may also be longitude dependent, VLF data were compared from four $L=4$ antarctic stations from a 2-day period in June 1982. Siple, Halley, and Sanae form a closely spaced (about 20-0 deg geomagnetic longitude) triplet, while Kerguelen is about 120 deg (geomagnetic) to the east, on the opposite side of the anomaly. To a large extent there was a repeatable diurnal variation in activity at all stations on the two days. Comparison of the spectral forms of whistler mode activity at neighboring stations suggests that wave generation occurs simultaneously over relatively wide longitude (or local time) sectors. (Auth. mod.)

K-43241

Jefferies, S.M., Pomerantz, M.A., Duvall, T.L., Harvey, J.W., **Helioseismology from the South Pole: 1987 results and 1988 campaign**, *Antarctic journal of the United States*, 1989 24(5), p.244-245, 5 refs.

Helioseismology probes the interior conditions of the Sun by measuring its global oscillations. The Sun oscillates at millions of slightly different frequencies centered around 3 megahertz. Different oscillations sample different ranges of depth and latitude and are also sensitive to rotation in varying ways. Because the frequency spectrum of solar oscillations is crowded, helioseismology observations must be made with good spatial and frequency resolution to help separate one oscillation mode from another. In 1987, in a recheck of some 1981 data, a discovery was made of some not previously known interior solar properties being altered by a waxing and waning of the solar magnetic cycle. The 1988 season brought into use a new camera system which proved to be quite successful, producing 261 hours of high quality data and 10 gigabytes of digital data.

K-43242

Hernandez, G., Smith, R.W., Clark, K.C., **Global thermospheric dynamics and thermodynamics from South Pole, Antarctica**, *Antarctic journal of the United States*, 1989 24(5), p.245-248, 10 refs.

The dynamics of the neutral thermosphere at high latitudes are largely determined by the configuration of the ionospheric electric field and the precipitation patterns associated with it. The present understanding of the high-latitude neutral thermospheric temperature and wind structure has been derived from ground-based data and satellite measurements. Currently there are three Fabry-Perot spectrometers in Antarctica, two of which are in continuous use at Halley Bay and at Amundsen-Scott Station. The South Pole experiment reported here is a high geomagnetic latitude ($L=14$) and is subject to high-latitude driving forces, while the instrument at Halley Bay is at comparatively low geomagnetic latitude ($L=4$) and thus is influenced by high-latitude driving forces only at moderate to high levels of geomagnetic disturbance. Because of the greater degree of offset between the geographic and geomagnetic coordinates in the Southern Hemisphere, the dual influences of ultraviolet and solar wind particle effects have a different interplay in the two hemispheres. Substantial asymmetries also exist in the polar cap winds because of the modulating effect caused by the rotation of the ionosphere about the south rotation pole and the corresponding changes in solar illumination.

K-43243

Gaier, T., Schuster, J., Lubin, P.M., **Cosmic background anisotropy measurement at 10 degrees**, *Antarctic journal of the United States*, 1989 24(5), p.249-250, 2 refs.

When observed with a radiometer (radiotelescope), the cosmic background radiation has a temperature of about 2.75 kelvin. Measurements of the degree of uniformity (isotropy) of the cosmic background radiation serve to provide information about the early Universe. Numerous measurements of the isotropy of the cosmic background radiation have shown it to be uniform to $\Delta T/T < .00002$ (where $T=2.75$ kelvin on arc-minute scales.) Experiments at scales greater than 10 degrees have measured a dipole anisotropy, believed to be a result of the peculiar motion of the galaxy with respect to very distant objects. The region of 1 to 10 degrees remains a relatively unexplored angular size. Measurement methods and data verification routines are explained and an assessment of the instrument operation is given.

K-43244

Meinhold, P.R., Lubin, P.M., Chingcuanco, A.O., Morris, D.E., **Anisotropy measurements of the cosmic background radiation from the South Pole at 1 degree**, *Antarctic journal of the United States*, 1989 24(5), p.251-252, 2 refs.

The search for structure in the spatial distribution of the cosmic background radiation is one of the few experimental tests of cosmological models. Currently no definitive detections of anisotropy have been made except for the dipole term, and upper limits of 20 to 200 parts per million have been established from 10 arc seconds to 90 degrees angular scale. In the region from 1 to 10 degrees, few experiments have been done with sufficient sensitivity seriously to constrain cosmological models, galaxy formation scenarios in particular. The two primary systematic difficulties with doing sensitive experiments in this angular range are the atmosphere, which has a time-varying structure, and galactic contamination, which must be modeled and possibly subtracted. A brief description of the experiment is given along with some of the results of the South Pole expedition.

K-43306

Sato, N., Saemundsson, T., **Unstructured Pc1-2 pulsations observed at geomagnetically conjugate stations in the auroral zones**, *Journal of geomagnetism and geoelectricity*, 1990 42(5), p.653-662, 13 refs.

A classification of Pc1 magnetic pulsations in the frequency-local time domain has been reported earlier, and in accordance with this classification the conjugacy of Pc1 magnetic pulsations has been examined, using simultaneous observation data at the conjugate pair of stations at Showa and Husafell. Reported here are the characteristics of the seasonal and diurnal dependence of unstructured Pc1-2 magnetic pulsations, using frequency-time spectra obtained at Showa and Mizuho in Antarctica and at Husafell and Isafjordur in Iceland. It is concluded that unstructured Pc1-2 pulsations observed on the ground are strongly controlled by sunlight effects. Sunlight may cause the asymmetry of wave propagation from the magnetosphere to the ionosphere in both hemispheres. It is suggested that Pc1-2 pulsations observed in the polar cusp and polar cleft regions on the ground may exhibit even stronger sunlight effects.

K-43307

Obara, T., **New system for operation and data handling of Akebono (EXOS-D) satellite**, *Journal of geomagnetism and geoelectricity*, 1990 42(4), p.565-577, 5 refs.

A ground system for the operation and data handling of the Akebono (EXOS-D) satellite is briefly reported in this paper. The satellite is remote-controlled from the Sagami-hara Operation Center (SOC). Data from the satellite are sent to the Sagami-hara main computer system where real time analysis can be carried out. Scientific data can be displayed as "QL plots" of which hard copies are used to find out interesting phenomena. Ephemeris data of the satellite are also stored in the ISAS (Institute of Space and Astronautical Science) data base. ISAS is linked to remote data handling subcenters through electronic networks and gives access to all Akebono data. Some of the data being processed is received at Showa Station. (Auth.)

K-43321

Dragovan, M., **Isotropy observations of the cosmic microwave background**, *Antarctic journal of the United States*, 1989 24(5), p.253-254.

A small (1.2 m) submillimeter telescope was used at Amundsen-Scott Station to search for anisotropy on the Wein side of the peak of the microwave background. Recent results by the Berkeley-Nagoya collaboration indicate an excess flux in the submillimeter background spectrum. To constrain the origin of the excess, it is necessary to measure its isotropy. Preliminary results are described following a description of the advantages of the South Pole site.

K-43322

Wu, Q., Rosenberg, T.J., **Auroral observations with the imaging riometer at South Pole Station**, *Antarctic journal of the United States*, 1989 24(5), p.254-255, 4 refs.

Since the beginning of 1988, the imaging riometer for ionospheric studies (IRIS) has been providing continuous images of ionospheric regions of cosmic radio noise absorption in the vicinity of South Pole Station. The technical details of the system were described by Detrick and Rosenberg (1988). Cosmic noise absorption is generated by electron precipitation, which during darkness can also produce auroral displays. The ability of the IRIS instrument to record absorption images during daytime and under adverse weather conditions has opened the door to further studies of auroral activities. One research area that can benefit from the availability of IRIS data is that associated with high-latitude auroral conjugacy.

K-43323

Chen, K.Y., Oliver, J.P., Wood, F.B., **Atmospheric extinction in blue and yellow light at the South Pole**, *Antarctic journal of the United States*, 1989 24(5), p.255-256, 2 refs.

During the 1988 austral winter, eight standard stars of the *UBV* system were observed at the South Pole with the use of the automated South Pole Optical Telescope. The purpose of such measurements is to determine the effect of the Earth atmosphere on stellar brightnesses, i.e., the atmospheric extinction, as part of a comprehensive evaluation of the South Pole as a site for a nighttime optical astronomical observatory. The observation was made photoelectrically with a blue filter and a yellow filter corresponding to the B and V magnitude, respectively. To the first approximation, with the neglect of color-dependent terms, the relations between the observed values of a star and the magnitudes in the *UBV* systems are given.

K-43324

Baker, K.B., Greenwald, R.A., **Observing the ionosphere with the Polar Anglo-American Conjugate Experiment radars**, *Antarctic journal of the United States*, 1989 24(5), p.256-258, 3 refs.

The report provides a resumé of the progress of a radar research effort by Britain and the United States called the Polar Anglo-American Conjugate Experiment (PACE). The project is studying the dynamics of the interaction between the solar wind and the ionosphere to find out how the Earth responds to its space environment. Two of the several published papers about the PACE project are discussed.

K-43325

Wolfe, A., Venkatesan, D., Slawinski, R., MacLennan, C.G., Lanzerotti, L.J., **Hydromagnetic-band magnetic variations observed in conjugate regions—South Pole and Iqaluit**, *Antarctic journal of the United States*, 1989 24(5), p.258-260, 8 refs.

Variations in the Earth's magnetic field in the hydromagnetic frequency range of approximately 0.022-0.1 hertz have been measured at the conjugate sites of Iqaluit, Frobisher Bay, and the geographic South Pole. The characteristics of Earth's hydromagnetic waves are dictated by magnetospheric plasma structure and by processes occurring within it and in the interplanetary medium. A relationship was sought between the dominant Pc3 frequency observed at both Iqaluit and South Pole during local daytime hours and hourly values of the interplanetary magnetic field magnitude and direction. No significant relationship is found between Pc3 frequency and the interplanetary magnetic field direction. A pattern is found, however, between Pc3 frequency and the interplanetary magnetic field magnitude, and is shown in a figure. Two frequency regimes emerge: for Pc3 frequency greater than or equal to 29 millihertz (Iqaluit) and Pc3 frequency greater than or equal to 28 millihertz (South Pole), Pc3 frequency tends to increase with interplanetary magnetic field magnitude. The observed frequency is independent of the interplanetary magnetic field magnitude for Pc3 frequency less than these values.

K-43326

Byrne, G.J., Benbrook, J.R., Bering, E.A., III, **Balloon-borne measurements of the global atmospheric-electrical circuit at the South Pole**, *Antarctic journal of the United States*, 1989 24(5), p.261-262, 6 refs.

In the South Pole balloon campaign during the austral summer of 1985-1986, eight stratospheric balloon payloads were launched from Amundsen-Scott South Pole Station. The payloads were instrumented to measure the vertical and horizontal components of the atmospheric electric field and the atmospheric conductivity. Over 460 hours of data were acquired from which a variety of scientific questions of the electrical processes in the lower and upper atmosphere can be addressed. In this report are presented observations of the electrical environment in the south polar stratosphere that have bearing on the nature of the Earth's global atmospheric-electrical circuit. The measured results, translated into the characteristics for quiet and disturbed geomagnetic conditions, are shown in graphs and explained in the text.

K-43327

Bering, E.A., III, Benbrook, J.R., Liang, D., **Balloon observations of the electric field over South Pole: convection patterns**, *Antarctic journal of the United States*, 1989 24(5), p.263-265, 6 refs.

The intent of this work is to determine if there are any differences between data obtained in this way and those obtained from other techniques. The amount of variability is one of the most impressive features in the electric field data obtained by the balloon. To understand the validity and limitations of the long-term averages as representation of the data, patterns of individual days have been examined. Examination of the South Pole balloon data shows that although some details of the temporal variation and dynamics may be lost in the long-term averaging process, the results help to quantify the dependence of the daily patterns on the interplanetary magnetic force and activity level and have consistently shown the features presented above. These features are basically in agreement with the observations over the Northern Hemisphere by radar and satellites. Data parameters examined include global average, Kp dependence, and interplanetary magnetic force dependence.

K-43328

Bering, E.A., III, Lin, Z.M., **Examples of high-latitude electric and magnetic-field perturbations that were not accompanied by solar wind pressure fluctuations**, *Antarctic journal of the United States*, 1989 24(5), p.266-268, 20 refs.

The study of impulsive magnetic and electric-field perturbations has been a topic of extreme interest recently. Attention was first focused on these perturbations by the suggestion that they represent the ionospheric signature of flux-transfer events. Subsequently, it was determined that many of these events were propagating east or west along the auroral oval, rather than anti-sunward, and that their diameter was 3 to 5 times larger than expected on the basis of simple flux-transfer-event models. Recently, there have been several suggestions made regarding the possibility that these events are all the result of pressure pulses in the solar wind passing the Earth. The generation of current vortices by means of impinging pressure pulses is a well-known model for the generation of mid-latitude Pc3 events. It is certainly possible for similar processes to be operating at higher latitude. The purpose of this paper is to present examples of impulsive events that are not accompanied by pressure pulses in the solar wind. Three events recorded at Amundsen-Scott Station were selected to point out the differences between impulse and solar wind pressures as the disturbing agents of the geomagnetic field. One is a conjugate-point example of a combination twin current vortex and a coaxial current system; the second shows solar wind pressure; and the third clones the first but on a different date.

K-43329

Arnoldy, R.L., Engebretson, M.J., Cahill, L.J., Jr., Potemra, T.A., **Ground and satellite investigation of a possible flux-transfer event**, *Antarctic journal of the United States*, 1989 24(5), p.269-271, 6 refs.

Understanding how energy carried by the solar wind gets deposited in the Earth's system of magnetic field, plasma, and neutral atmosphere is one of the central questions of solar-terrestrial physics. Clearly, the interaction is mediated by the solar magnetic field embedded in the solar wind plasma and the Earth's magnetic field which ultimately becomes stressed and serves as an intermediate repository of energy. Measurements have indicated that segments of the Earth's magnetic field on the dayside of the magnetosphere at radial distances of about 10 Earth radii might become opened and connected to the solar magnetic field carried by the solar wind. These segments of magnetic field will then be carried by the solar wind to the nightside by convection through the magnetosphere where they again become closed Earth field lines through the same process of reconnection. This whole process is known as a flux transfer event. This paper presents Viking satellite data which was magnetically conjugate to the ground station at Søndre Strømfjord, Greenland, at the time of the flux-transfer event signature. The suite of satellite data consists of magnetic and electric-field data along with charged particle measurements. The analysis of this event is still in progress, so only a preliminary summary of the results is presented here.

K-43330

Burgess, W.C., Inan, U.S., **Simultaneous lightning-associated precipitation of radiation belt-electrons into the Northern and Southern Hemispheres**, *Antarctic journal of the United States*, 1989 24(5), p.271-273, 9 refs.

Recent very-low-frequency radio recordings at Palmer Station and at Arecibo, Puerto Rico provide the first ground-based evidence that individual lightning flashes can induce bursts of high-energy electrons to precipitate from the radiation belts into both Northern and Southern Hemispheres. Simultaneous signal perturbations were recorded between 0954 and 0958 universal time on Mar. 21, 1989. The amplitude of a 23.4 kilohertz signal from the U.S. Navy transmitter in Hawaii (NPM) was measured at Palmer Station. The amplitude of a 48.5 kilohertz signal from the U.S. Air Force transmitter in Nebraska was measured at Arecibo, Puerto Rico. The great-circle propagation paths of these two signals come no closer than about 5,500 km to each other (the distance between the transmitters); however, both paths do cross regions which are geomagnetically conjugate to each other. Of 46 perturbations measured at Arecibo between 0939 and 1000 universal time, 44 occurred within 800 milliseconds of a similar perturbation observed at Palmer Station. Similar activity took place during the time prior to and after the period shown, as well as on the preceding and following days.

K-43362

Saka, O., Sato, N., Uchida, S., **Development of unmanned magnetometer stations for use in Antarctica**, *Antarctic science*, Dec. 1990 2(4), p.355-361, 4 refs.

Unmanned magnetometer stations (UMS) have been developed and were installed at remote locations near Showa Station to perform field tests. The UMS were powered by a thermoelectric generator fuelled by kerosene (LTEG) which supplies 87 watts continuously to the load. The LTEG and instrumentation (fluxgate magnetometer, data logger, chronometer) were installed in a thermally insulated shelter (0.9 m by 1.8 m by 1.9 m). The shelter and an 800 l fuel tank were mounted on a sled, and were towed by snow tractor. The UMS were installed at Kizahasi Beach, Skarvsnes (50 km southwest of Showa) and at H-100 of the Mizuho route (100 km south of Showa), in the early spring of 1988, and operated until the end of the year. The data obtained will be used for a study of the spatial phase and amplitude structure of the ionospheric current systems and a response of the local induction currents to them. (Auth.)

K-43424

Taylor, M.J., **Photometry of the 4686 Å emission line of gamma-2 Velorum from the South Pole**, *Astronomical journal*, Oct. 1990 100(4), p.1264-1269, 15 refs.

An automated optical telescope located at the Amundsen-Scott Station has been used to obtain more than 78 hr of photometry of the He II emission line (4686 Å) of the spectroscopic binary gamma-2 Velorum. These data were obtained on seven different "days" during the 1987 austral winter; the longest "continuous run" spans 19 hr. In this paper, two independent period search techniques have been used to search for periodic behavior in the strength of the He II emission line of this Wolf-Rayet star. They are power spectrum analysis, and a first-order sine function fit to the data using least squares. Various multiplicities of a period on the order of 1.3 hr with amplitudes of a few percent are found in most of these data. According to recent theoretical models of Wolf-Rayet stars, fluctuations in the He II emission line may indicate vibrational instability in gamma-2 Vel. These pulsations may, in turn, give rise to shocks which propagate outward and which may provide the necessary conditions for periodic changes in the state of a given region of the atmosphere to occur. (Auth.)

K-43513

Saxton, J.M., Clilverd, M.A., **Structure and motion in the inner magnetosphere, studied with very low frequency radio waves**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.3-8, 9 refs.

In 1985 an observatory was established at the British Antarctic Survey Faraday Base to study the Earth's inner magnetosphere using very low frequency (VLF) radio waves. In 1986 two VLF Doppler receivers were installed; these record whistler mode signals (that have travelled through the magnetosphere) from the US Navy transmitters NAA and NSS located in the northeast USA. The VLF Doppler receivers provide a unique and powerful tool for studying the inner magnetosphere near L=2.5; the data are being used to study plasma drifts, densities, electric fields and wave propagation. (Auth.)

K-43514

Rishbeth, H., Wrenn, G.L., Van Eyken, A.P., Rodger, A.S., **Ionospheric storms in the Antarctic**, British Antarctic Survey Antarctic Special Topic Award Scheme Symposium, Nov. 9-10, 1988. Proceedings. University research in Antarctica, edited by R.B. Heywood, Cambridge, British Antarctic Survey, 1989, p.9-21, 29 refs.

Analysis of an extensive set of ionospheric data from Halley Bay, Argentine Is., South Georgia and Port Stanley, covering the years 1971-1978, has given new insights into the physics of F layer storms. Following a brief study of storm onset times to search for systematic differences between stations, an extensive study was made of the averaged perturbations, expressed as functions of local time, season and geomagnetic activity. These average perturbations can be described in terms of 'AC' effects (which depend on local time) and 'DC' effects (changes of mean level). Both AC and DC effects vary with season in a systematic way, and become more pronounced with increasing latitude. Changes of F2 layer height during storms are found to be generally consistent with thermal expansion, due to the heating of the upper atmosphere during storms. Possible causes of the DC and AC effects are reviewed. (Auth. mod.)

K-43580

Wu, Q., Rosenberg, T.J., Lanzerotti, L.J., MacLennan, C.G., Wolfe, A., **Seasonal and diurnal variations of the latitude of the westward auroral electrojet in the nightside polar cap**, *Journal of geophysical research*, Feb. 1, 1991 96(A2), p.1409-1419, 25 refs.

Simultaneous measurements of magnetic field variations at the nominally conjugate sites of South Pole Station and Iqaluit, Canada, have been used to study latitude differences in the location of corresponding westward electrojets in the nightside polar cap. The resulting data base comprised 60 events distributed seasonally as follows: austral summer (17); fall (6); winter (18); spring (19). Seasonal and diurnal variations of the latitude of westward electrojets were evident during solstice periods. In particular, it is noted that the substorm westward electrojet flows at higher latitudes in the winter hemisphere than in the summer hemisphere, after 2000 MLT. The latitude difference between the two hemispheres maximizes at about 4 deg near local midnight. The latitude difference becomes smaller away from midnight and reverses for local times prior to about 2000 MLT. The observed seasonal and diurnal variations are generally consistent with predictions of the effect of the magnetic dipole tilt on the location of last closed field lines. The implications of an asymmetric distribution of the plasma sheet with respect to the neutral sheet have also been considered. Such a postulated distribution can account for the seasonal variations while conserving magnetic flux and maintaining pressure balance across the tail. (Auth. mod.)

K-43638

Sato, N., ed, NIPR Symposium on Upper Atmosphere Physics, 12th, Tokyo, Jan. 17-18, 1989, **Proceedings of the NIPR Symposium on Upper Atmosphere Physics, No.3**, Tokyo, National Institute of Polar Research, 1990, 108p., Refs. passim. For selected papers see K-43639 through K-43643.

This volume contains 11 selected papers among 55 individual contributions presented at the 12th Symposium on Coordinated Observations of the Ionosphere and the Magnetosphere in the Polar Regions, held at the National Institute of Polar Research on Jan. 17-18, 1989. Four full-length papers and one extended abstract are pertinent to Antarctica and deal with auroral dynamics, ULF wave phenomena, geomagnetically conjugate observations and disturbances in the ionosphere.

K-43639

Kikuchi, T., Yamagishi, H., **Drift of auroral absorption observed in February 1986 with the scanning beam riometer at Syowa Station**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.3, Tokyo, National Institute of Polar Research, 1990, p.12-23, 17 refs.

The scanning beam riometer at Showa Station detected drifts of auroral absorptions during a severe geomagnetic storm. Eastward drifts predominated in the morning sector on Feb. 8, 1986, with speeds ranging from 1.0 to 3.8 km/s. The eastward drift takes place with a decrease in the geomagnetic *H*-component, with its speed being proportional to the *H*-component deviation from the quiet time level. It is suggested that both the absorption drift and ionospheric currents are subjected to a common earthward electric field in the magnetosphere. Therefore, the high drift velocity may indicate an intensification of the electric field in the magnetosphere. (Auth. mod.)

K-43640

Takahashi, K., Anderson, B.J., Potemra, T.A., **Studies of ULF waves with AMPTE CCE spacecraft: review of spacecraft observations and outlook on ground/space studies**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.3, Tokyo, National Institute of Polar Research, 1990, p.43-60, Refs. p.58-60.

Studies of ULF pulsations based on observations with the AMPTE CCE spacecraft are reviewed and suggestions are made for future ground/satellite studies of ULF waves. CCE is an elliptically orbiting satellite with an apogee of 8.8 *R*(E) and a low-inclination of 4.8 deg. These orbital characteristics make the spacecraft very useful for examining the spatial variation of ULF wave properties. Wave types reviewed in this paper include transverse Pc 3-5 waves, compressional Pc 5 waves, and Pi 2 waves. Possible subjects of future ground/satellite studies include giant pulsations and Pc 1 waves. Some preliminary results are presented using data from Showa and other ground-based stations. (Auth.)

K-43641

Tsunomura, S., **Rough estimation of induction characteristics for geomagnetic variations at Syowa and Iceland**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.3, Tokyo, National Institute of Polar Research, 1990, p.61-69, 3 refs.

Basic characteristics of geomagnetic induction at Showa Station are estimated by showing the induction arrows for various types of geomagnetic disturbances using one-second values of geomagnetic field. Satisfactory solutions are obtained for the daytime disturbances. Induction arrows at Iceland are also obtained using the daytime disturbances. At Showa Station, the induction arrows for periods longer than several minutes reveal a coastline effect of Lützow-Holm Bay, while an island effect is apparent for shorter periods. At Iceland, the coastline effect is dominant at Isafjörður and Tjörnes but the induction effects are generally small at Husafell. The induction characteristics obtained here can be referred to as basic relationships in the analyses of geomagnetic phenomena dealing with the vertical component of geomagnetic variations. (Auth.)

K-43642

Tanaka, T., Ogawa, T., Maeno, H., Yamamoto, S., **Type 5 echoes observed by VHF Doppler radar at the auroral ionosphere**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.3, Tokyo, National Institute of Polar Research, 1990, p.86-90, 4 refs.

A new type of coherent radar echo from the auroral E region, which shows a narrow spectrum peak around 12 Hz, has been observed by 50 MHz VHF Doppler radar at Showa Station during severe magnetic disturbances. The appearance of the new type echoes are restricted to post-midnight hours. Plasma waves responsible for these echoes seem to propagate obliquely to the magnetic field. (Auth.)

K-43643

Ogawa, T., **HF radar experiment at Syowa Station for the study of high-latitude ionosphere-2: a capability (extended abstract)**, NIPR Symposium on Upper Atmosphere Physics, Proceedings. No.3, Tokyo, National Institute of Polar Research, 1990, p.91-95, 5 refs. For part 1 see 18K-41731.

As one of the ground-based upper atmosphere observations at Showa Station during the STEP period (1990-1995), an HF radar experiment was proposed for exploring the high-latitude ionosphere. The proposed HF radar can observe a wide area of the E- and F-region over Antarctica. In order to detect backscattered echoes from field-aligned ionospheric irregularities, radar wave vectors must be nearly

perpendicular (between 89 and 91 deg) to the geomagnetic field. The propagation path of an HF wave emitted from Showa Station was calculated to find the region (radar range and altitude) where the perpendicularity condition is achieved. Results are shown for wave frequencies of 10, 15 and 20 MHz.

K-43647

Callis, L.B., **Precipitating relativistic electrons: their long-term effect on stratospheric odd nitrogen levels**, *Journal of geophysical research*, Feb. 20, 1991 96(D2), p.2939-2976, Refs. p.2974-2976.

Using electron count rate data at geostationary orbit, the authors have developed daily energy spectra extending from 30 keV to MeV for trapped relativistic electrons at 6.6 R(E). These spectra have been used to model the flux of these electrons into the atmosphere at 120 km. Energy deposition calculations permit daily sources of HOx and NOy to be calculated at auroral and subauroral latitudes due to relativistic electron precipitation (REP) for the period June 13, 1979, through June 4, 1988. Both short-term and long-term source variations are quite large over the period considered. The largest long-term increases are found in the lower stratosphere at high latitudes. The results suggest that a significant contribution to the anomalously large and unexplained global O₃ declines between 1979 and 1985 has been made by the catalytic destruction of O₃ by odd nitrogen in the lower stratosphere at mid- to high latitudes. Results from a Scott Base partial reflection experiment are reviewed, which suggest that a thin layer of ionization occasionally exists in the 45-50 km height interval. (Auth. mod.)

K-43685

Sun, X., Li, Z., **Experiment of short wave communication and the investigation of the propagation bearings between the Great Wall Station and Xinxiang**, *Antarctic research*, Dec. 1990 1(1), p.67-74, 6 refs.

The distance from the Great Wall Station to Xinxiang is 16981 km. The path passes through the polar cap absorption region and the auroral absorption zone, and it is across the equator. The effects of short wave communication and usable time blocks and frequency ranges between the Great Wall Station and Xinxiang from Dec. 1985 to Mar. 1986 are introduced. The comparison between the usable frequency ranges with the estimated MUF is made. The upper limit of frequency ranges of communication along the short great circle path basically agrees with the MUF, but there is a difference between them along the long great circle path. The propagation along the great circle path is the main propagation mode. The non-great circle path propagation varies with time because the ionospheric absorption and other conditions which support the non-great circle path propagation are a function of time. (Auth. mod.)

K-43695

Sheldon, W.R., **On the precipitation of relativistic electrons from the outer belt**, *Journal of atmospheric and terrestrial physics*, Jan./Feb. 1991 53(1/2), p.17-23, 25 refs.

Data from the DMSP satellite due to relativistic electrons in the region of the outer belt are investigated. The data are interpreted by means of a model in which a partially filled drift loss cone plays a prominent role. The model, which described the loss of outer belt electrons at L=4 through gradient and curvature drift in the drift loss cone, has been modified to also include the effect of wave-particle interactions. Predictions of the model are in good agreement with the DMSP data. This result indicates that electron drift in the drift loss cone, known to dominate electron precipitation phenomena at lower latitudes, is important at outer belt latitudes as well. This effect, and the degree of partial filling of the drift loss cone which is consistent with the DMPS data, indicates that slow pitch angle diffusion dominates the morphology of outer belt electrons, a point which appears to be controversial. Finally, it is concluded that half of the

electron precipitation from the outer belt is caused by wave-particle interactions, and the other half by auroral activity and electron drift *per se* in the drift loss cone. Data from Siple Station are used in this study and the included graphs show data to about 70S. (Auth. mod.)

K-43696

Thomas, L., Astin, I., **Compression and rarefaction of F-region plasma caused by an atmospheric gravity wave**, *Journal of atmospheric and terrestrial physics*, Jan./Feb. 1991 53(1/2), p.49-52, 9 refs.

The Advanced Ionospheric Sounder at Halley has been used to observe the F-region disturbance caused by an atmospheric gravity wave. Observations at 4.5 MHz were used to examine the variations of group range, obtained from time-of-flight measurements, and of Doppler shift, derived from Fourier analysis of the quadrature components of the signal. A comparison of simultaneous values of group-range and phase-path velocities shows clear evidence of compression and rarefaction of ionization, and more complicated changes in the height distribution of ionization in the oscillatory changes associated with the wave. (Auth.)

K-43697

Astin, I., Thomas, L., **Rapid fading of radio waves reflected from sporadic -E ionization**, *Journal of atmospheric and terrestrial physics*, Jan./Feb. 1991 53(1/2), p.99-104, 8 refs.

A digital ionosonde has been used at Halley to examine the fading on time scales of a few seconds of 4.5 MHz signals reflected from sporadic -E ionization. Fourier analysis of the phase and amplitude of the signals is used to show that the fading arises from the interference of returns from discrete echoes. The locations of these echoes are derived from phase measurements at pairs of antennae separated in North-South and East-West directions, together with information on group ranges. (Auth.)

K-43705

Zhao, X., **Experiment and research on the nighttime TE1 mode of VLF signals in Antarctica**, *Antarctic research*, 1990 2(2), p.51-60, In Chinese with English summary. 4 refs.

When the VLF signals from stations located at middle or low latitudes are travelling across the equator along the direction from northeast to southwest, or from southeast to northwest, the TE wave is present by the coupling effect of the geomagnetic field. Based on the VLF phase observation at the Great Wall Station in Antarctica, it is found that the TE1 mode becomes dominant during nighttime in the propagation direction from northeast to southwest at a long distance; for a GBR signal (16 kHz), the mode conversion interference produces a cycle slip during the sunrise transition at a distance of 13,660.7 km from the transmitter. In this case, the mode conversion coefficient from the TM1 to the TE1 mode during the sunrise transition is estimated to be 0.28. (Auth. mod.)

K-43715

Serra, F.M., **On the suppression of wave growth and triggering in VLF multi-wave experiments**, *Planetary and space science*, Dec. 1984 32(12), p.1577-1589, 23 refs.

DLC QC 801.P5

In experiments employing two monochromatic whistler-mode trains, simultaneously injected from Siple Station, two kinds of suppression phenomena were identified and reported by Helliwell in 1983. The first occurs for small frequency separations (about 20-30 Hz) and involves the mutual suppression of wave growth and triggering of both signals; the second type of suppression is asymmetrical: it occurs only in the lower frequency wave, for frequency separations larger than those for which mutual suppression is detected. Here are

discussed the mechanisms underlying these effects based on a wave-particle interaction description, in the presence of two waves. Mutual suppression of wave growth and triggering is understood as a consequence of the mutual inhibition of the waves to phase trap resonant electrons: this is expected to perturb the development of transverse resonant currents supported by the electrons, thereby causing suppression of growth and triggering of both waves. Concerning the origin of the asymmetric-type suppression occurring in the lower frequency (f_1) wave, a different two-wave interaction mechanism is contemplated, assuming the suppression to be related to the perturbing effects caused by the higher frequency (f_1) wave on the electron population that would have resonated with f_1 in the absence of f_2 . (Auth. mod.)

K-43719

Warnecke, J., Lühr, H., Takahashi, K., **Observational features of field line resonances excited by solar wind pressure variations on 4 September 1984**, *Planetary and space science*, Dec. 1990 38(12), p.1517-1531, 28 refs.

In the course of the magnetic storm of Sep. 4, 1984, after an inverse sudden impulse (SI), geomagnetic pulsations in the Pc5-frequency range were observed at magnetometer stations in the local evening sector. They occurred at L -values of about 6, and lasted for several hours, their period increasing from about 320 to 550 s. In this study, two events of enhanced activity are discussed in some detail. During the 16:00 U.T. event, a favorable position of the *AMPTE/IRM* spacecraft allows conjugate observations in the Northern and Southern Hemispheres and in the magnetosphere. This constellation permits a precise determination of the wave node. During a later intensification around 18:00 U.T., the *AMPTE/CCE* spacecraft near local noon monitored poloidal waves, obviously driving the pulsations on the ground. Generally, the observations are consistent with the theory of field line resonance. They are interpreted as being excited by pressure variations in the solar wind. The hydromagnetic cavity mode is assumed to link the magnetopause surface motions to the field line resonances. Numerous textual references are made to data from Showa Station, and these data are also depicted in diagrams accompanying the study. (Auth. mod.)

K-43720

Morrison, K., **Quasi-periodic VLF emissions and concurrent magnetic pulsations seen at $L=4$** , *Planetary and space science*, Dec. 1990 38(12), p.1555-1565, 25 refs.

The first observations are presented from Halley Station of quasi-periodic (QP) VLF intensity variations modulated at the frequency of concurrent Pc3 magnetic pulsations. Seen on broadband frequency-time plots, the QP emissions are of both the dispersive and non-dispersive types. From the frequency and phase variation with time of the QP emissions and magnetic pulsations, estimates are obtained of the travel times of the ULF waves from the interaction region to the ground. The observations appear consistent with the idea of modulation of a pre-existing VLF hiss source in the magnetosphere by the compressional components of ULF waves. A significant change in the travel time during one event is consistent with a crossing of the plasmapause by the Halley fieldline. (Auth.)

K-43751

Liu, C., Zhang, P., Jiao, C., **Winter characteristics of Sq variation of geomagnetic field at the Chinese Great Wall Station, Antarctica**, *Antarctic research*, 1990 2(3), p.46-52, In Chinese with English summary. 6 refs.

An analysis is made of the winter characteristics of Sq variations of the geomagnetic field in the region of the Great Wall Station (GWS), using data collected during Apr.-Sep. 1987. It is shown that the morphology of Sq variation in early winter (Apr.) and late winter (Sep.), at GWS, is similar to that at Beijing Geomagnetic Observatory at middle latitude of the Northern Hemisphere and may be controlled

by the midlatitude dynamo currents. The amplitude of Sq variation is very small, and consists of harmonics of 8 hrs or less in midwinter due to the decreasing effect of solar ultraviolet radiation and the dominating disturbances at high latitude. The equivalent current vectors of Sq in the daytime are about 5 times larger than at night. The vector directions are clockwise in the daytime (8-15h) and counter-clockwise at night in early winter and late winter. The vectors in the daytime or at night are very small due to the decreasing effect of the current intensity in the ionosphere in midwinter. The equivalent current vector directions of Sq in early winter and late winter are different from those in midwinter. This may be the effect of ionospheric currents, or field-aligned current, in the polar region. (Auth. mod.)

K-43752

Du, J., Sun, X., **BPM field strength measurements at China Great Wall Station in Antarctica**, *Antarctic research*, 1990 2(3), p.53-56, In Chinese with English summary. 3 refs.

Experimental results of short wave BPM field strength, investigated at the Great Wall Station, are discussed. It is found that they agree with results obtained with the FTZ model; the RMS deviation is 6.9 db micro-v/m. The FTZ method is recommended. (Auth. mod.)

K-43859

Bol'shakova, O.V., Klain, B.I., Kurazhkovskaia, N.A., **Peculiarities of high-latitude long period pulsations in the Southern Hemisphere** [Osobennosti vysokoshirotnykh dlinnoperiodnykh pul'satsii vlp v IUzhnom polusharii], *Antarktika; doklady komissii*, 1990 No.29, p.47-51, In Russian with English summary. 12 refs.

Regularities of long period pulsation behavior in the Southern Hemisphere are investigated. Results show that, according to magnetic activity and parameters of the interplanetary magnetic field, the pulsations have an evident north-south asymmetry, which can be associated with peculiarities of the reconnection processes in the day-side magnetopause. (Auth.)

K-43860

Gul'el'mi, A.V., Dovbnia, B.V., Matveeva, E.T., Shchepetnov, R.V., **Polar cap geomagnetic pulsations and their use for solar wind structure diagnostics** [Geomagnitnye pul'satsii v poliarnoï shapke i ikh ispol'zovanie dlia diagnostiki struktury solnechnogo vetra], *Antarktika; doklady komissii*, 1990 No.29, p.52-56, In Russian with English summary. 9 refs.

An unknown type of geomagnetic pulsation was discovered in the range of 0.5-4.0 Hz in the course of observations at the Mirnyy Station. The pulsations are observed in the region of the dayside aurora oval at enhanced wind density. The pulsation frequency rises with an increase of solar wind density and velocity. According to the whole complex of their characteristics, the pulsations appear during the Earth's immersion in the "plasmasphere" of the flare stream. (Auth.)

K-43902

Solodovnikov, G.K., Sviridenko, L.P., Ivanov, I.U.G., Shirochkov, A.V., Shumilov, I.A., **Statistics of radio signal amplitude fluctuations with parameter changes in the interplanetary magnetic field** [Statistika fliuktuatsii amplitud radiosignalov pri izmenenii parametrov mezhplanetnogo magnitnogo polia], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.71-76, In Russian. 12 refs.

On the basis of data obtained by the Kosmos-381 satellite, as recorded at Molodezhnaya Station during Dec. 1970-Jan. 1971, a study was carried out to evaluate the influence of the interplanetary magnetic field on radio signal statistics in high latitudes characterizing the ionospheric plasma instability, and the role it plays in the radio wave scattering mechanism. Results are found helpful in geophysical investigations in magnetically conjugate areas, the diagnosis and forecasting of ionospheric and magnetospheric conditions, and the construction of ionospheric models at high latitudes.

K-43903

Spivakov, V.V., **Spectra of geomagnetic disturbances at antarctic stations in 1978** [Spektry geomagnitnikh vozmushchenii na antarkticheskikh stantsiakh v 1978 g], *Sovetskaia antarkticheskaia ekspeditsiia. Informatsionnyi biulleten'*, 1990 No.113, p.76-79, In Russian. 4 refs.

Results of a study conducted at various Soviet stations in 1978 on spectral variations of the geomagnetic field are discussed. A table showing dependence of harmonic amplitudes on geomagnetic latitudes, recorded at 90, 80, 70 and 65S, is presented. Two peculiarities are pointed out: most harmonic amplitudes (excluding those of 7 hr periods) at Vostok Station, located on the magnetic field, are below those at other antarctic stations; and at all latitudes studied, harmonic amplitudes increase during the 9 and 7 hr periods.

K-43929

Sato, N., **Upper atmosphere physics data, Syowa and Asuka Stations, 1988, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1991 No.169, 212p., 9 refs.

The report summarizes upper atmosphere physics data acquired by the "Upper Atmosphere Physics Monitoring Systems" at Showa and Asuka Stations in 1988. The items of observations at Showa are as follows. Geomagnetism: H-, D-, and Z-components of magnetic variations, total force of the geomagnetic field, H-, D-, and Z-components of magnetic pulsations. ELF-VLF: intensities at 0.35, 0.75, 1.2, 2, 4, 8, 30, 60 and 95 kHz, wide-band (0-15 kHz) signal of ELF-VLF emissions. Ionosphere: cosmic noise absorption at 30 MHz. Aurora: meridian scanning record at 3 wavelengths; OI 5577 Å, 6300 Å and H (beta) 4861 Å, auroral intensity of N2+ 1NG 4278 Å in 3 directions (30 deg poleward, zenith and 30 deg equatorward). The following are observation items for Asuka Station: geomagnetism: H-, D- and Z-components of magnetic variations, H- and D-components of magnetic pulsations. The Upper Atmosphere Physics Monitoring Systems were installed at Showa in Jan. 1981, and at Asuka in Jan. 1987. An outline of the systems is given. An outline of the monitoring system, instrumentation and data format, and the format of the compiled digital data are included. Magnetograms for Jan. 1-Dec. 31, 1988 for both stations are appended.

K-43941

Pinnock, M., **Ionospheric signature of possible enhanced magnetic field merging on the dayside magnetopause**, *Journal of atmospheric and terrestrial physics*, Mar./Apr. 1991 53(3/4), p.201-212, 31 refs.

Identifying the causative mechanisms at the magnetopause that produce a variety of transient plasma velocity signatures in the high latitude ionosphere is difficult. Observations in conjugate hemispheres offer the chance to distinguish between events triggered by merging and those initiated by solar wind pressure variations, if the direction of travel of the ionospheric signatures can be determined. Using data from two conjugate HF radars, high temporal resolution measurements of the F-region plasma convection in the vicinity of the cusp are presented for Apr. 22, 1988. Two poleward-directed bursts of high plasma velocities (about 2000 m/s) were observed in the Southern Hemisphere, with a weaker (about 1000 m/s) response in the Northern Hemisphere. These flow bursts are interpreted as a sig-

nature of an event driven by magnetic merging at the magnetopause, primarily because the motion of the flow burst features in each hemisphere was conditioned by the prevailing east-west component of the IMF. The azimuthal variation of the radar's line-of-sight velocities may be interpreted as showing the presence of vortices, which is consistent with theoretical models advanced for the ionospheric signature of patchy reconnection. However, the presence of vortices was not detected by the radar until at least 3 min after the onset of the poleward flow burst. The hemispherical differences in the plasma velocities of the flow burst events may be explained in terms of the differences in the mapping of the magnetopause merging lines to the conjugate hemispheres. The observations being interpreted are from data received at Halley Station and at Goose Bay, Labrador. (Auth. mod.)

K-43942

Dudeney, J.R., **Studies of conjugate plasma convection in the vicinity of the Harang discontinuity**, *Journal of atmospheric and terrestrial physics*, Mar./Apr. 1991 53(3/4), p.249-263, 32 refs.

Two case studies are presented of the large-scale nightside ionospheric plasma convection observed simultaneously in the two polar regions using HF backscatter radars. The case studies occur during geomagnetically quiet conditions, and for one of the two periods the interplanetary magnetic field (IMF) is known to be northwards. For both cases plasma generally convects westward in the evening and eastward in the morning. The times at which the nightside flow reversal (the Harang discontinuity) occurs is observed to differ by several hours between the hemispheres, and between the two study periods. For the case where IMF data are available, the nightside plasma flow is shown to respond to a step change in the IMF y-component (becoming less negative), with a time delay of about 25 min. In the Southern Hemisphere, the flow reversal appeared simply to be shifted to later magnetic local times, whilst for the Northern Hemisphere the evening westward flow was disrupted by the occurrence of eastward flow ahead of the Harang discontinuity. The backscatter radar data derive from observations made at Goose Bay, Labrador and at Halley Station, Antarctica. (Auth. mod.)

K-43943

Mravlag, E., Scourfield, M.W.J., Walker, A.D.M., Sutcliffe, P.R., Nielsen, E., **Simultaneous observations of omega band related phenomena in both hemispheres**, *Journal of atmospheric and terrestrial physics*, Mar./Apr. 1991 53(3/4), p.309-317, 10 refs.

In Antarctica, magnetic *Ps6* pulsations have been observed simultaneously at a number of stations together with all-sky imagery of omega bands at Sanae. For the same nights, in the Northern Hemisphere, all-sky imagery from Sodankylä and Kilpisjärvi and STARE radar data are reported. These observations allow one to infer that omega band related phenomena occur on the same day in both hemispheres after local magnetic midnight. In the Southern Hemisphere these phenomena were observed over a range of 65 deg longitude between about $L=4$ and $L=6$. Interestingly, the activity switched on simultaneously over the range of longitudes. For the Northern Hemisphere, observations were only available for a range of approximately 7 deg longitude between $L=5$ and $L=6$. (Auth.)

K-43944

Aslin, P.M., Jarvis, M.J., Morrison, K., **Ionosonde signatures of *Pc1* pulsations**, *Journal of atmospheric and terrestrial physics*, Mar./Apr. 1991 53(3/4), p.343-349, 25 refs.

The first observations of the signatures of *Pc1* pulsations in ionosonde echo data are reported. Oscillations are frequently observed in Doppler velocity, echo amplitude, group range and skymap echo-location position, and are clearly associated with simultaneous

Pc1 geomagnetic micropulsations with a similar frequency. These oscillations, recorded at the sub-auroral antarctic station of Halley (L about 4.2), occur in either or both E - and F -region echo time series during a wide range of ionospheric conditions. Focusing of the ionospheric echoes due to the compressional action of the hydromagnetic wave is suggested as a possible mechanism. (Auth.)

K-43948

Maeno, H., Yamamoto, S., **Records of radio aurora at Syowa Station, Antarctica 1989, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1991 No.167, 42p., Refs. p.4-5.

E-region ionospheric irregularities associated with polar disturbances have been observed at Showa Station by auroral radars since Mar. 1966. This report represents data obtained in 1989 for 50 MHz and 112 MHz radio aurora intensity, and includes station location, observer, method of measurement, characteristics of the radar system, and explanation of the data diagrams. Also included is a bibliography relevant to records of radio aurora at Showa Station between 1966 and 1988.

K-43949

Maeno, H., Yamamoto, S., **Riometer records of 30 MHz cosmic noise at Syowa Station, Antarctica in 1989, Japanese Antarctic Research Expedition. JARE data reports**, Mar. 1991 No.168, 184p.

At Showa Station, absorption of cosmic radio noise has been observed with a standard riometer (relative ionospheric opacity meter) at 30 MHz, since Feb. 1966. This report presents data observed from Jan. 1 to Dec. 31, 1989, in the format of hourly values and raw data plots. In the raw data plots, other data than riometer observations are also presented for reference. These data include HF, Mg, VLF and radar observations. A bibliography relevant to riometer records at 30 MHz cosmic noise at Showa between 1967 and 1988 is included.

K-44037

Candidi, M., Adriani, A., Agnelli, G., Maggi, M., Viterbini, M., **Status report for the all-sky camera project, Italian Research on Antarctic Atmosphere, Conference proceedings. Vol.27, Bologna, Italian Physical Society, 1990, p.337-340.**

A project for the installation of an all-sky camera at the Terra Nova Bay Station is outlined. The instrument will photograph the entire visible sky over the station, when operational. The pictures taken during the antarctic night will be used to study the morphology and dynamics of the auroral forms, also in correlation with measurements made in the magnetosphere with satellite experiments. Pictures taken during daylight may be used to study cloud systems and airglow. (Auth.)

K-44338

Eichhorn, G., **GRAD high-altitude balloon flight over Antarctica, High energy radiation background in space: CHERBS—1987, Sanibel Island, FL, edited by A.C. Rester, Jr., and J.I. Trombka, New York, American Institute of Physics, 1989, p.359-365, 3 refs.**

DLC QB991.C64C48

The Gamma Ray Advanced Detector (GRAD) consists of an n -type germanium detector inside an active bismuth-germanate Compton and charged particle shield with additional active plastic shielding across the aperture. It will be flown on a high altitude balloon at 36 km altitude at a latitude of 78S over Antarctica for observations of gamma radiation emitted by the radioactive decay of Co-56 in the Supernova SN1987A, for assessment of the performance of bismuth-germanate scintillation material in the radiation environment of near

space, for gathering information on the gamma-ray background over Antarctica, and for testing fault-tolerant software. (Auth.)

K-44428

Bering, E.A., **Intense magnetic storm of December 19, 1980: observations at $L=4$, Journal of geophysical research**, Apr. 1, 1991 96(A4), p.5597-5617, 58 refs.

Observations at Siple Station and two other antarctic sites of the movement of the dayside oval to $L=4$ or less during the intense geomagnetic storm on Dec. 19-20, 1980 are discussed. Siple Station was poleward of the auroral oval at the height of the event. This large expansion of the oval is consistent with the level of disturbance that was seen. Magnetograms suggest that a localized current system intensification was centered near local dawn during the event. The presence of a Ps 6 micropulsation event and the local time of the event suggests that this current was a driven system intensification. The occurrence of an unloading system substorm current wedge at an unusual local time cannot be ruled out, however. The electric field associated with the eastward electrojet during the recovery phase was much larger than normally found in the auroral zone. A prolonged subauroral ion drift event of unusual intensity was encountered during the storm's recovery phase.

K-44429

Hernandez, G., McCormac, F.G., Smith, R.W., **Austral thermospheric wind circulation and interplanetary magnetic field orientation, Journal of geophysical research**, Apr. 1, 1991 96(A4), p.5777-5783, 19 refs.

Ground-based high-resolution spectral measurements of the OI 1-D emission at 15,867 Å (630 nm; 1 K=1/cm) from thermospheric altitudes at the geographic south pole are used to determine the relationship between the Southern Hemisphere high-latitude thermospheric wind circulation and the interplanetary magnetic field (IMF) during the austral winter of 1989. A clear dependence is shown between the thermospheric wind direction and magnitude and the IMF. In the midnight sector, the zonal wind magnitude is dependent on B_y , and the meridional component on B_x . The magnetic local times of the largest polar cap electric fields are also inferred for either sign of B_y . In addition, it is shown that the field angle of the IMF in the Y-Z plane is also useful for ordering the neutral wind data. These ground-based wind measurements also reflect the polarity and magnitude of the IMF, at least near the observing station's magnetic midnight. (Auth.)

K-44431

Meinhold, P., Lubin, P., **Medium-scale measurement of the cosmic microwave background at 3.3 millimeters, Astrophysical journal**, Mar. 20, 1991 370(1), p.L11-L14, 11 refs.

A system was developed for making measurements of spatial fluctuations in the cosmic microwave background radiation, on an angular scale of 5' to a few degrees. The system consists of an off-axis Gregorian telescope with a nearly Gaussian response with full width at half-maximum (FWHM) adjustable from 20' to 50', a superconductor-insulator-superconductor (SIS) coherent receiver operating at 3.3 mm, and a pointing system capable of better than 1' RMS stabilization. Results are reported from the system's first balloon flight in Aug. 1988, and ground-based measurements made from the South Pole in Dec. 1988. A portion of the South Pole data is used. Dust contamination is estimated in the cosmic background radiation data using measurements of the Galaxy from this flight and a previous one, along with the IRAS 100 micron map. These anisotropy results give the most stringent limits on cold dark matter theories to date. (Auth. mod.)

K-44523

Rodger, A.D., Stewart, R.D., **Lower thermospheric wind measurements near 60 deg Λ from 5577Å Doppler interferometry**, *Advances in space research*, 1990 10(6), p.(6)187-(6)190, 15 refs.

Fabry-Perot interferometer measurements of the Doppler shift of the 5577Å OIS emission are used to derive neutral wind velocities at E-region altitudes over Halley Station. These measurements, recorded during the Lower Thermosphere Coupling Study (LTCS) period in Sep. 1987, show relatively large amplitude oscillatory wind fields of approximately 50-100 m/s during geomagnetically quiet periods, but remarkably low wind velocities during geomagnetically active periods (approximately 10 m/s). A brief interpretation of these observations is presented. (Auth.)

K-44524

Hillas, A.M., **South Pole air shower experiment**, *Società Italiana di Fisica. Conference proceedings*, 1989 Vol.19, Vulcano Workshop 1988. Frontier objects in astrophysics and particle physics. Edited by F. Giovannelli and G. Mannocchi, p.309-312, 2 refs.

DLC QB460.V85 1989

A scintillator array to detect air showers with a median energy of 140 TeV has been set up within 0.4 km of the South Pole, as a joint project of the Bartol Research Institute and the University of Leeds. The aim is to provide continuous monitoring of many X-ray sources in the southern sky, and to look for ultra high energy gamma ray emission. The array is operating with high efficiency, justifying the choice of site, and has an estimated angular error of about 1.1 deg r.m.s. in space angle on average, as expected. The high efficiency is illustrated in the case of SN1987a, as data from the first 18 days of operation will give the most sensitive limit so far obtained for the 100 TeV emission from this object. (Auth.)

K-44565

Reid, G.C., Solomon, S., **Response of the middle atmosphere to the solar proton events of August-December, 1989**, *Geophysical research letters*, June 1991 18(6), p.1019-1022, 17 refs.

Intense solar activity during the period Aug.-Dec. 1989 gave rise to several major energetic-particle events, which were accompanied by greatly enhanced ionization rates and NOy production in the polar regions of both hemispheres. A two-dimensional model of the chemistry and dynamics of the middle atmosphere has been used to calculate the production and subsequent fate of the NOy and its effect on ozone concentrations and temperatures. In the sunlit southern polar cap, NO increases as large as a factor of 20 are estimated near 60 km altitude, with column density enhancements of 55%. Corresponding peak ozone depletions of about 20% are calculated near 40 km in late Oct. 1989, with predicted temperature decreases of about 3-3.5K. Effects in the northern polar regions are considerably smaller, due to the lack of sunlight during the peak phase of the events. (Auth.)

K-44624

Lanzerotti, L.J., **Hydromagnetic phenomena at the magnetopause and in the magnetosphere**, *Revista brasileira de geofisica*, June-Dec. 1990 8(1-2), p.35-47, With Portuguese summary. Refs. p.45-47.

Spacecraft and ground-based techniques have been used jointly in recent years to study hydromagnetic waves and currents at high day-side latitudes along geomagnetic field lines which connect through the boundary layer and magnetopause. This paper reviews some current observational work and relates it to present theoretical ideas. The ground-based data were obtained primarily from Bell Laboratories instrumentation installed at the high latitude stations South Pole, Antarctica, and Iqaluit, Canada. These stations are located approxi-

mately at opposite ends of a geomagnetic flux tube. Topics covered include: transmission of hydromagnetic waves across the magnetopause and into the magnetosphere; relationships of hydromagnetic power and waves to interplanetary solar wind parameters; relationship of localized field-aligned currents to magnetopause and boundary layer processes; and ionosphere electric fields and auroral emissions accompanying localized field-aligned currents. (Auth. mod.)

K-44695

Cazeneuve, H., **Geomagnetic activity cycles induced by the solar equatorial current** [Ciclos de actividad geomagnética inducidos por la corriente ecuatorial solar], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1991 No.382, 19p., In Spanish with English summary. 13 refs.

Geomagnetic data from 10 antarctic stations covering a wide range in longitude are analyzed. Geomagnetic disturbances observed during a period of minimum solar activity exhibit a clear dependence on the polarity of the interplanetary magnetic field. At each polarity reversal, a cycle of activity starts which lasts as long as the polarity sector itself. Since the polarity of the interplanetary magnetic field is closely associated with the solar equatorial current, it can be inferred that the cycles of geomagnetic activity are critically dependent upon the traverses of the Earth across the heliographic current sheet. In that situation, a power input into the magnetosphere may take place and trigger the substorm process. (Auth. mod.)

K-44698

Cazeneuve, H., Grinson, M., **Prediction of magnetic activity at high austral latitudes** [Predicción de la actividad magnética en altas latitudes australes], *Buenos Aires. Instituto Antártico Argentino. Contribución*, 1989 No.380, 22p., In Spanish with English and French summaries. 15 refs.

Linear predictive theory is applied to the prediction of geomagnetic activity using data on solar wind parameters obtained at 7 antarctic stations. Results show that the geomagnetic variations at the stations can be predicted by applying a "deformation" to the solar wind parameters with a linear filter. The filter function attains a first maximum within one hour following the initial power input, and a second maximum five hours later. This indicates a rapid response following the power input, and a delayed excitation, which in turn is followed by several damped oscillations. (Auth. mod.)

K-44723

Kuntz, V.L.R., Piazza, L.R., Kaufmann, P., **C-layer dependence on solar cycle and southern latitude observed by VLF propagation**, *Journal of atmospheric and terrestrial physics*, May 1991 53(5), p.419-423, 13 refs.

The formation of the C-layer as observed on long distance VLF propagation paths may be described as an additional phase advance during the normal sunrise phase advance. The effect has a typical recovery time of 90 min. It has been verified that it occurs not only in winter, as previously suggested, but that it is also independent of seasonal variations, when the angle between the solar illumination line (terminator) and the propagation path is small. Analysis of different propagation paths in southern latitudes shows that the magnitude of the observed effect exhibits an annual variation and a latitudinal and solar cycle dependence. (Auth. mod.)

K-44758

Zi, M.Y., Shen, C.S., **Polar ionosphere and the magnetosphere-ionosphere coupling**, *Antarctic research*, 1990 2(4), p.50-56, In Chinese with English summary. 10 refs.

An overall investigation of the temporal and spatial variation of the polar ionosphere has been developed after the use of the incoher-

ent scatter technique which can simultaneously observe several parameters of the polar ionosphere. During geomagnetic storms, following an increase of the inflation rate of the ring current, the ion drift velocity (representing the convection electric field) increases significantly, and the electron distribution of the polar ionosphere is much different from the that of its normal state. Even during the geomagnetic quiet days the effect of plasma convection can be seen from the diurnal and seasonal variation of the electron density. Several important problems can be investigated by simultaneous observation in southern and northern polar regions (especially at the magnetic conjugate points). The topics include the driving of the magnetospheric convection (by either electric potential or current); the process which may cause the dawn-dusk asymmetry of convection; the reversal of the convection and the transport process in the magnetospheric boundary layer, and the effect caused by the deviation of the geomagnetic axis from the geographic axis. (Auth. mod.)

K-44760

Li, Z., **Report on Halley's Comet, Antarctic research**, 1990 2(4), p.64-69 and 73-74, In Chinese with English summary.

Eight photographs of Halley's Comet, and records of observations carried out at the Great Wall Station during Mar. 16-Apr. 19, 1986, are presented in this report.

K-44766

Lowder, D.M., **Observations of muons using the polar ice cap as a Cerenkov detector**, *Nature*, Sep. 26, 1991 353(6342), p.331-333, 11 refs.

Detection of the small flux of extraterrestrial neutrinos expected at energies above 1 TeV, and identification of their astrophysical point sources, will require neutrino telescopes with effective areas measured in square kilometers—much larger than detectors now existing. Such a device can be built only by using some naturally occurring detecting medium of enormous extent: deep antarctic ice is a strong candidate. A neutrino telescope could be constructed by drilling holes in the ice with hot water into which photomultiplier tubes could be placed to a depth of 1 km. Neutrinos would be recorded, as in underground neutrino detectors using water as the medium, by the observation of Cerenkov radiation from secondary muons. The AMANDA (Antarctic Muon and Neutrino Detector Array) project has been started to test this idea. Described here is a pilot experiment using photomultiplier tubes placed into arctic ice in Greenland. Cerenkov radiation from muons was detected, and a comparison of count rate with the expected muon flux indicates that the ice is very transparent, with an absorption length greater than 18 m. These results suggest that a full-scale antarctic ice detector is technically quite feasible. (Auth.)

K-44783

Humble, J.E., Duldig, M.L., Smart, D.F., Shea, M.A., **Detection of 0.5-15 GeV solar protons on 29 September 1989 at Australian stations**, *Geophysical research letters*, Apr. 1991 18(4), p.737-740, 11 refs.

A major cosmic ray ground-level enhancement, the largest in 33 years, occurred on Sep. 29, 1989 during which intensity enhancements at Australian observatories ranged up to a maximum of 344% at Mt. Wellington. The Darwin neutron monitor (cutoff rigidity 14.1 GV) recorded a 13% increase in the five-minute counting rate, indicating that solar particles up to at least 15 GeV must have been present. Surface muon detectors at Hobart and Mawson recorded increased influxes, but the event was not recorded by underground muon detectors at either station. Preliminary analysis of the solar particle flux during the initial phase of the event shows a hard spectrum approximated equally well by an exponential spectrum with a Po of 2.0 GV or by a modified power law spectrum of exponent about -2.9. Particles arriving at the detectors from non-vertical directions make a significant contribution to the total increase recorded at mid- and low-latitude stations. (Auth.)

K-44894

De Petris, M., **Interplanetary perturbation-induced effects on polar ozone level**, *Annales geophysicae*, June 1991 9(6), p.381-386, 26 refs.

A study of the possible linkage between the ozone depletion of the antarctic atmosphere and the interplanetary travelling perturbations coming from solar wind sources is discussed. It is suggested that, during solar cycle 21, a significant change occurred in the solar wind regime which may have affected the terrestrial environment and hence the ozone equilibrium. (Auth. mod.)

K-44936

Hargreaves, J.K., Detrick, D.L., Rosenberg, T.J., **Space-time structure of auroral radio absorption events observed with the imaging riometer at south pole**, *Radio science*, July-Aug. 1991 26(4), p.925-930, 15 refs.

An imaging riometer system comprising 49 independent beams has been operating at South Pole Station since Jan. 1988. A study of intense, short-duration events from the premidnight sector has defined their typical shape as elliptical, with axial ratio 2.3 oriented along the local L shell. The space-time evolution shows rapid intensifications of the moving absorption patches. (Auth.)

K-44964

Deng, W., Killeen, T.L., Burns, A.G., Roble, R.G., **Flywheel effect: ionospheric currents after a geomagnetic storm**, *Geophysical research letters*, Oct. 1991 18(10), p.1845-1848, 13 refs.

In the period following a geomagnetic storm the high latitude, magnetospheric driven convection pattern is normally weak. However, the neutral circulation, set up by ion-neutral momentum coupling during the main phase of the storm, may continue for several hours after the storm has ended. This persistent neutral circulation has the potential to drive Hall currents for some hours. In this paper these "flywheel" currents are investigated by simulating a storm which occurred on the 23rd of Nov. 1982, using the National Center for Atmospheric Research Thermosphere Ionosphere General Circulation Model (NCAR-TIGCM). The resulting high latitude, height integrated Hall currents are dominated by the neutral wind driven component for several hours after the end of main phase of the storm. The direction of these currents is reversed from normal. Analysis of the neutral and ion components of this current system indicates that the neutral component may drive as much as 80% of the high latitude current system immediately after the storm has ended, and may continue to dominate this system for 4 to 5 hours. The study ranges over the Southern Hemispheric high latitudes to about 75S. (Auth.)

K-44981

Bond, F.R., **Background to the aurora australis**, *Australian National Antarctic Research Expeditions. ANARE reports*, 1990 No.135, 192p., Refs. p.181-189.

This book is intended as an introduction for students beginning a study of aurora as part of the study of upper atmospheric physics. It deals with only those parts of the general subject of upper atmosphere physics that are directly necessary to present an outline of present knowledge of the aurora. Only the descriptive phase of physics is presented. Numerous charts, graphs, satellite pictures of aurorae and a glossary are included.

K-45044

Rippeth, Y., Moffett, R.J., Bailey, G.J., **Model plasmasphere calculations for L -values near 2.5 at the longitude of Argentine Islands, Antarctica**, *Journal of atmospheric and terrestrial physics*, June/July 1991 53(6/7), p.551-555, 13 refs.

A model of the terrestrial plasmasphere that includes an eccentric dipole geomagnetic field has been developed. Calculations are carried out for tubes of plasma at the longitude of Argentine Is. Results for L -values around 2.5 are compared with those obtained in VLF experiments at Faraday that detect whistler signals from NAA and NSS stations in the northeast U.S.A. Calculated group delay and Doppler shift of whistler signals are analyzed by the usual technique employed by experimenters at Faraday to deduce meridional ExB plasma drift and rate of change of plasma tube content (i.e., ionosphere-plasmasphere flux). The deduced drifts and fluxes are compared with those from the model. (Auth.)

K-45045

Beggs, H.M., **Correlation between variations in the amplitude and change in the phase path of a radio signal reflected from a travelling ionospheric disturbance**, *Journal of atmospheric and terrestrial physics*, June/July 1991 53(6/7), p.577-580, 17 refs.

Analysis of data from an oblique HF phase path sounder deployed on subantarctic Macquarie I. revealed quasi-periodic variations in the amplitude and change in phase path of the daytime radio echo when a travelling ionospheric disturbance (TID) was present at the point of reflection. The daytime amplitude records exhibit signatures of TIDs with a cut-off period at 23 min, whereas signatures appear in the daytime change in phase path records for TID periods up to 65 min. This phenomenon was investigated using ray-tracing analysis. (Auth.)

See also:

A-44217 A-44845 B-43512 E-44856 E-44867 F-43157 F-43212
F-44550 F-44975 G-44004 G-44718 I-42905 I-44474 I-44564
I-44782 I-44879 I-45043 I-45057

L. TERRESTRIAL PHYSICS

L-42988

Kaminuma, K., Dibble, R.R., **Seismicity of Erebus volcano, Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.168-176, 10 refs.

Mount Erebus is presently the only antarctic volcano with sustained eruptive activity in the past 15 years. The seismic activity during 1981-1988 is summarized as follows: the number of earthquakes increased from 10 to over 100 events per day up to 1984, then they decreased to about 20 events per day maximum. Also, from 1981 to 1984, earthquakes occurred throughout Ross I., but were confined to the Mt. Erebus area after 1984. Several earthquake swarms occurred every year during 1982-1984, but only 1-2 swarms were recorded during 1985-1986, and none in 1987. A remarkable change of the background seismicity was recognized before and after the 1984 activity. A strict comparison of the origin times of the explosions and the associated earthquakes was made, using both seismic data and video recordings, showing that the earthquakes occurred before the explosion. (Auth. mod.)

L-42993

Lu, C., Hao, X., **Research on gravity observation in Fildes region of Antarctica and its neighbouring region**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.215-221, 6 refs.

Gravity measurements and the datum point international connection measurement, carried out at 12 stations on the Fildes Peninsula, are discussed. By using the theory of earth gravity field, the gravity Bouguer anomaly near the Great Wall Station, and gravity anomaly of the region between 40-80S and 50-70W, are calculated. Results, presented in tables, are used for analysis of gravity field in the area for a better understanding of the geological and crustal structures of the region.

L-42994

Lu, W., Wu, S., **Characteristics of the magnetic field in southeast Pacific and its tectonic evolution**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.221-233, 9 refs.

Based on the characteristics and composition of the geomagnetic field of the southeast Pacific and the Drake Passage, the magnetic anomalies in the region can be divided into 3 groups: Pacific-Antarctic ridge magnetic anomaly province; Chile ridge and Patagonia magnetic anomaly province; and Bellingshausen Sea and Drake Passage magnetic anomaly province. The study of geological history confirms that the ocean crust in this region is no older than Late Cretaceous. At that time, 85-81 m.y.B.P., the Pacific-Antarctic ridge was formed; during Paleocene to Early Eocene, 65-53 m.y.B.P., the Aluck ridge was formed. Aluck ridge and Chile ridge subducted beneath the Antarctic Peninsula and South America due to spreading centers moving to the north and spreading of the Pacific-Antarctic ridge. The opening of the Drake Passage, and the formation of the Antarctic Circumpolar Current, occurring in Late Oligocene to end of Pliocene, marked the last important events in the fragmentation of Gondwanaland.

L-42997

Jiang, J., Gao, J., Xu, D., **Source of the concave point of the geoid's pear-shape in Antarctica**, International Symposium on Antarctic Research. Proceedings, Tianjin, China Ocean Press, 1989, p.250-257, 14 refs.

This paper attempts to find the source of the concave point of the geoid's pear-shape in Antarctica which may come from the interior of the lithosphere. Using seismic sounding data, the crustal thickness in Antarctica has been calculated along with the gravity data. On the basis of it, the geoid's undulation caused by the anomalies of mass within the lithosphere was computed. Compared with the geoid's undulation calculated from the satellite gravitational data, although the entire undulatory figure of the geoid is basically affected by sources deep within the lower mantle of Antarctica, the anomalies of mass within the lithosphere are dominating the concave point of the geoid's pear-shape. Although the crust has begun to bound back, the isostatic adjustment couldn't sufficiently compensate the loss of mass from glacial retreats, thus the concave point of the geoid's pear-shape has appeared in Antarctica. It is concluded that the actual ellipsoid flattening of the Earth is larger than the ellipsoid flattening in hydrostatic equilibrium. (Auth. mod.)

L-43052

Suetova, I.A., Berliant, A.M., Lazarev, G.E., Ushakov, S.A., **Reconstruction of the bedrock of Antarctica after deglaciation** [Rekonstruktsiia koren'nogo rel'efa Antarktidy posle degliatsiatsii], *Akademiia nauk SSSR. Institut geografii. Materialy gliatsiologicheskikh issledovanii*, Nov. 1989 No.67, p.127-131, In Russian with English summary. 9 refs.

Analysis of the maps: the "Value of isostatic elevation of Antarctica after the release of glacial load" and the "Bedrock of Antarctica after deglaciation" yielded the following results: the total mass of the Earth's crust, elevated due to deglaciation, equals 6.2 million cu km; the mean value of isostatic elevation is 450 m. It was also possible to determine the mean altitude and area of Antarctica within its geographical and geophysical limits. Comparison of the mean altitude (500 m) of the reconstructed bedrock, of the area of Antarctica (16.620 million sq km) in its geographical limits (like the Earth's crust) to the same morphometric properties of the other continents shows that its mean altitude would not differ from the rest of the continents. (Auth. mod.)

L-43053

Redfield, T., Kienle, J., **Gravimetric study of the Transantarctic Mountains in northern Victoria Land**, *Antarctic journal of the United States*, 1989 24(5), p.36, 2 refs.

Initial data analysis has revealed the presence of large negative Bouguer gravity anomalies beneath the Transantarctic Mountains. In the Mount Melbourne field area an average gradient of about 2 milligals per km was observed. In the Rennick field area the magnitude of the gradient was less, at approximately 0.5 milligals per km. The gradient in the Mount Melbourne Quadrangle is about a factor 2 lower than gradients described by Smithson (1972) for the Transantarctic Mountains in the McMurdo Sound area. These data may be tested against lithospheric flexural uplift models of the Transantarctic Mountains such as those proposed by Stern and ten Brink (1989).

L-43110

Naito, I., Kikuchi, N., **Seasonal budget of the Earth's axial angular momentum**, *Geophysical research letters*, Apr. 1990 17(5), p.631-634, 15 refs.

The budget is based on the core-mantle decoupling (CMD) hypothesis, using the length of day (LOD) data observed astronomically by the International Radio Interferometry Surveying and the atmospheric angular momentum data calculated from the forecast/analysis data set for numerical weather prediction of the Japan Meteorological Agency. Atmospheric relative angular momentum changes due to zonal wind account for an additional 23% contribution over the annual budget. However, this is counterbalanced by the effects of the redistributions of air and water masses. About 16% is accounted for by the redistribution of air mass, and the remaining 7% agrees with the contribution from surface water storage estimate on continents by Chao and O'Connor [1988]. These facts demonstrate a confirmation of the CMD hypothesis on a time scale of a year. At the semi-annual period, however, there still is a shortage of about 6% in atmospheric and hydrospheric contributions to the budget. The role of the Antarctic Circumpolar Current is pointed out and its influence on the angular momentum budget is assessed. (Auth.)

L-43176

Nagihara, S., Lawver, L.A., **Heat-flow measurements in the King George Basin, Bransfield Strait, Antarctic journal of the United States**, 1989 24(5), p.123-125, 6 refs.

During R/V *Polar Duke* PD-IV-89 cruise, a marine heat-flow survey was conducted in the King George Basin of Bransfield Strait. The objective was to investigate the tectonic history of this basin and the presumed occurrence of hydrothermal activity. Thermal gradient data was collected at 54 stations and *in situ* thermal conductivity data at 22 of those stations. Piston cores were taken at six sites and were used for thermal conductivity measurements made on board using the needle-probe technique. In conjunction with the heat-flow survey, seismic surveys were made with the 3.5-kilohertz echo sounder and the single-channel seismic reflection system which used a 100-cubic-inch water gun. Throughout the King George Basin, the sea floor is flat (1,960-1,990 m) and well sedimented although no basement structure could be seen.

L-43292

Sakai, R., Shibuya, K., Ayukawa, M., **Installation of geomagnetic absolute observation point at Seal Rocks, East Antarctica, and the absolute observations in 1987**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.80-89, 5 refs.

A non-magnetic pillar for observation of geomagnetic field was installed at Seal Rocks in Jan. 1987 by JARE-28. A G.S.I. (second-order) precise magnetometer was set on the pillar, and absolute measurements of the geomagnetic field were made 7 times during Sep. 19-Dec. 18, 1987. The averaged values of the observed declination angle, inclination angle and the total magnetic intensity are -36.3 deg (westward), -63.9 deg (upward) and 43073 nT, respectively. These observed values are consistent with the theoretical values calculated by the IGRF (1985) model. (Auth.)

L-43293

Akamatsu, J., Ichikawa, N., Kaminuma, K., **Seismic observation with local telemetry network around Syowa Station, East Antarctica (2)**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.90-99, 12 refs. For part 1 see 18L-41540.

A local telemetry seismic network was established around Showa Station to study local seismicity and wave characteristics in the Lüt-

zow-Holm Bay region. More than 14,000 events were recorded during the period from June 1987 through Jan. 1989. Most of them were icequakes, though 1043 teleseisms and 9 local earthquakes were identified. Local earthquakes of magnitude ranging from -1 to 3 occurred in the coastal and offshore regions of the continent. No earthquakes with M larger than 2 seemed to occur within 500 km under the continent. The locations of local earthquakes are discussed in relation to possible faults inferred from surface geology and submarine topography. Locations of iceshocks of sea ice were examined to confirm the velocity model. Iceshocks occurred mainly in the boundary area between the multi-year ice and the first-year ice. (Auth.)

L-43295

Fukuda, Y., Segawa, J., Kaminuma, K., **Geoidal undulation and gravity anomaly around the Japanese antarctic stations estimated from both satellite altimeter data and surface gravity data**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.108-118, 19 refs.

Gravity anomalies and geoidal undulations around the Japanese antarctic stations have been newly estimated using both satellite altimeter data and surface gravity data. The method employed is the Least Squares Collocation by which both data can be dealt with simultaneously with exact estimates of formal errors. The data employed are surface gravity data mainly from JARE and GEOSAT altimeter data. (Auth. mod.)

L-43298

Kaminuma, K., Dibble, R.R., **Seismic activity of Mount Erebus in 1981-1988**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.142-148, 14 refs.

Seismic observations by radio telemetry have continued in the summit area and on the slopes of Erebus Volcano on Ross I. since 1980. Remarkable changes of seismic activity were recognized before and after the new phase of volcanic activity in Sep. 1984. The activity had been increasing from the early stage of the observations until the new phase in 1984. The daily number of earthquakes was over 150 in 1984 and less than 20 in 1988. The seismic activities of Mount Erebus in 1981-1988 are divided into the following four stages: normal high activity, preceding the new phase, new phase in activity and low seismic activity. (Auth. mod.)

L-43303

Nogi, Y., Seama, N., Isezaki, N., **Preliminary report of three components of geomagnetic field measured on board the icebreaker *Shirase* during JARE-30, 1988-1989**, NIPR Symposium on Antarctic Geosciences, Proceedings. No.4, Tokyo, National Institute of Polar Research, 1990, p.191-200, 14 refs.

Measurements of the three geomagnetic field components were carried out on board the icebreaker *Shirase* during JARE-30. Vector anomalies of geomagnetic field were obtained, and the directions of magnetic lineations were determined from the vector anomalies. They are in good agreement with the results previously reported along the ship's tracks, except for the antarctic continental margin and the Enderby Basin. In the antarctic continental margin, a N-S trending magnetic structure that coincides with the Australian-Antarctic depression is detected between Australia and Antarctica, and the local magnetic anomaly that seems to be caused by the Napier Complex appears between 50E and 60E along 63S. In the Enderby Basin, around 60S, N-S and NNE-SSW trending magnetic lineations which have never been reported before are detected. These results may suggest new constraints on the evolution of the Indian Ocean. (Auth. mod.)

L-43415

Bell, R.E., Brozena, J.M., Haxby, W.F., LaBrecque, J.L., **Continental margins of the western Weddell Sea: insights from airborne gravity and Geosat-derived gravity**, *American Geophysical Union. Antarctic research series*, 1990 Vol.50, Contributions to antarctic research 1, edited by C.R. Bentley, p.91-102, Refs. p.100-101.

Comparison of airborne gravity data and a new satellite-derived gravity field in the western Weddell Sea illustrates that both methods are capable of recovering features with amplitudes of less than 10 mgal and wavelengths between 20 and 30 km. The combined gravity field of the western Weddell reveals the location of the Larsen margin and the Ronne margin, as well as interesting features including a large gravity negative in the southwestern corner, fracture zone lineations in the oceanic crust, and a prominent east-west gravity ridge. The location of the Larsen margin is shifted landward to the west over 100 km from previous maps. The sediment thickness is estimated to be at least 4 km beneath the Larsen margin and 7 km beneath the Ronne margin. The Ronne margin is continuous with the well-surveyed margins to the east. The complex rift-related structures (the Andenes and Explora escarpments) mapped in the eastern Weddell do not continue to the west beneath the Ronne margin. (Auth.)

L-43506

Sadovskii, M.A., Avsiuk, I.U.N., **Causes of the aseismicity of Antarctica** [Prichina aseismichnosti Antarktidy], *Akademiia nauk SSSR. Doklady*, 1990 314(6), p.1369-1374, In Russian. 12 refs.

Epicenters of earthquakes with a magnitude greater than 5 are not found in Antarctica. The sole distinction of Antarctica lies in the fact that the entire continent is covered with a plastic material—ice. In this work the authors attempt to explain the aseismicity of Antarctica from the standpoint of a model of the dynamically stressed geophysical environment, which seems to be capable of explaining the normal and “pathological” development of regional seismic activity. (Auth. mod.)

L-43607

Dumas, B., **Presence of Trident III on the antarctic continent** [Présence du Trident III sur le continent antarctique], *Navigation*, Apr. 1986 34(134), p.223-237, In French with English summary.

Within the framework of the German polar scientific mission GANOVEX IV during the austral summer of 1984-1985, the CCNS/Trident III navigation system was used for an aeromagnetic survey aboard two polar Dornier 228-100s. The area chosen for the work covered a surface of 240,000 sq km over the Ross Sea and north Victoria Land. Several Trident stations, supplied by solar energy, were installed to obtain the required navigation accuracy. The success of the mission was complete, the recorded ranges were greater than 300 km, and aircraft positioning was accurate to within 20-40 m. During the mission, 48,000 km of profile data were obtained. (Auth. mod.)

L-43613

Brozena, J., **Airborne gravity measurement over sea-ice: the western Weddell Sea**, *Geophysical research letters*, Oct. 1990 17(11), p.1941-1944, 11 refs.

An airborne gravity study of the western Weddell Sea has shown that floating pack-ice provides a useful radar altimetric reference surface for altitude and vertical acceleration corrections to airborne gravimetry. Airborne gravimetry provides an important alternative to satellite altimetry for the sea-ice covered regions of the world, since satellite altimeters are not designed or intended to provide accurate geoidal heights in areas where significant sea-ice is present within the radar footprint. Errors in radar corrected airborne gravimetry are

primarily sensitive to the variations in the second derivative of the sea-ice reference surface in the frequency pass-band of interest. With the exception of imbedded icebergs, the second derivative of the pack-ice surface closely approximates that of the mean sea-level surface at wavelengths > 10-20 km. With the airborne method the percentage of ice coverage, the mixture of first and multi-year ice and the existence of leads and pressure ridges prove to be unimportant in determining gravity anomalies at scales of geophysical and geodetic interest, provided that the ice is floating and not grounded. In the Weddell study an analysis of 85 crosstrack miss-ties distributed over 25 data tracks yields an rms error of 2.2 mGals. Significant structural anomalies, including the continental shelf and offsets and lineations interpreted as fracture zones recording the early spreading directions within the Weddell Sea, are observed in the gravity map. (Auth.)

L-43662

Cheng, A.I.M., **Satellite magnetic survey in southern high latitudes**, Madison, University of Wisconsin, 1988, 223p., University Microfilms order No.89-01155, Ph.D. thesis. Refs. p.215-223.

Scalar magnetic anomaly maps over Antarctica derived from MAG-SAT (1979) contain ionospheric current signatures to an unknown degree. The presence of such pollution in previously published maps has been identified in this study. To avoid the uncertainty in how the currents alter the crustal anomaly patterns, a new technique for satellite magnetic analysis is developed. It records the geographic locations of every peak and trough along a magnetic profile onto a map of the studied area. The congregations of these peaks and troughs will then form images of the regional tectonic/geologic features. Linear features, such as fracture zones and spreading zones, are most clearly presented. Large faults are also inferred from a shift in the distributions of peaks and troughs. The results correlate with the geology known in the antarctic region exceptionally well. Satellite magnetic surveys will always face the problems of current interferences. Although it may not be possible to remove these noises, this study shows that it is possible to isolate them and reduce their influences. (Auth. mod.)

L-43708

Jia, G., **Seismological observation at the Great Wall Station during austral winter of 1986**, *Antarctic research*, 1990 2(2), p.81-85, In Chinese with English summary. 3 refs.

Seismological observations were carried out at the Great Wall Station during Mar. 30-Oct. 25, 1986, for a total of 271 days in which more than 3000 seismic events were recorded, most of them microseisms generated by the breaking and fractures of ice layers. Four are shallow marine earthquakes near the South Shetland Is. An M=8.1 earthquake occurred in the Aleutian Is. on May 7, and an M=6.4 earthquake occurred in the South Sandwich Is. on Apr. 14, 1986. There is a significant difference between icequakes and tectonic earthquakes as seen from seismic records on Nov. 16. The icequake is characterized by a sharp first motion, high frequency and rapid attenuation. (Auth. mod.)

L-43714

Damm, V., **Results of geomagnetic mapping and petromagnetic investigations in the area of the Schirmacherian Oasis (Antarctica)** [Ergebnisse geomagnetischer Kartierungsarbeiten und petromagnetischer Untersuchungen im Bereich der Schirmacheroase (Antarktika)], *Zeitschrift für angewandte Geologie*, Jan. 1986 32(1), p.1-6, In German with English, German, and Russian summaries. 16 refs.

The comparison of results of a geomagnetic mapping of the Schirmacher Oasis and a photogeological interpretation of a petromagnetic

fabric analysis and completion of microscopical investigation allow conclusions on the deformation fabric and the main tension axes in the area of sampling. From the results it is concluded that the petromagnetic fabric was influenced by retrograde mineral alterations produced by a later ruptural deformation. (Auth.)

L-43721

Hornig, I., Wörner, G., **Zirconolite-bearing ultra-potassic veins in a mantle-xenolith from Mt. Melbourne volcanic field, Victoria Land, Antarctica**, *Contributions to mineralogy and petrology*, Jan. 1991 106(3), p.355-366, 46 refs.

One mantle xenolith from a basanite host of the Mt. Melbourne volcanic field (Ross Sea Rift) is extraordinary in containing veins filled with leucite, plagioclase, clinopyroxene, nepheline, Mg-ilmenite, apatite, titaniferous mica, and the rare mineral zirconolite. These veins show extensive reaction with the dunitic or lherzolitic host (olivine + spinel + orthopyroxene + clinopyroxene). The reaction areas contain skeletal olivine and diopside crystals, plagioclase, phlogopite, aluminous spinel and ilmenite in a fine grained groundmass of aluminous spinel, clinopyroxene, olivine, plagioclase and interstitial leucite. The vein composition estimated from modal abundances and microprobe analyses is a mafic leucite-phonolite with high amounts of K, Al, Ti, Zr and Nb but low volatile contents. The melt is unrelated to the host basanite, and was probably derived by small-scale melting of incompatible element-enriched phlogopite-bearing mantle material. It must have lost most of its volatile content during migration, crystallization and reaction with the host dunite. While the veins are completely undeformed, the dunitic host shows slight deformation. Mantle material at shallow depths is consistent with rifting and the regional extreme displacement at the transition from the rifted Victoria Land Basin in the Ross Sea to the uplifted Trans-Antarctic Mountains. (Auth. mod.)

L-43722

Maslanyj, M.P., Storey, B.C., **Regional aeromagnetic anomalies in Ellsworth Land: crustal structure and Mesozoic microplate boundaries within West Antarctica**, *Tectonics*, Dec. 1990 9(6), p.1515-1532, 48 refs.

A regional aeromagnetic reconnaissance of Ellsworth Land between 72 and 80 degrees S and 65 and 100 degrees W, provides the opportunity to study the ice-covered area where several continental crustal blocks meet: Antarctic Peninsula, Thurston Island, Ellsworth-Whitmore Mountains and Haag Nunataks. The data can be used to test the validity of the microplate hypotheses by delimiting their boundaries and identifying crustal lineaments which may help constrain microplate kinematic models. The boundaries of the Haag Nunataks block are examined and the extent of similar basement rocks beneath the thick sedimentary sequence within both the Weddell Sea embayment and the Ellsworth-Whitmore Mountains is discussed. (Auth. mod.)

L-43754

Kaminuma, K., Murakami, H., **Seismological bulletin of Syowa Station, Antarctica, 1989**, *Japanese Antarctic Research Expedition. JARE data reports*, Jan. 1991 No.160, 66p., 3 refs.

A brief description is given of the seismic instrumentation in use at Showa Station. The arrangement of monitoring and support equipment is shown in diagrams, and epicenters of the 195 events in 1989 are plotted on charts. Operation of the computerized system and data types is explained. Tabular data show onset times and directions of initial ground movement and a list of the 195 events. Pen-monitor examples of short and long period seismograms of 12 teleseismic events are given in the Appendix.

L-43785

Delisle, G., Fromm, K., **Paleomagnetic investigation of Ferrar Supergroup rocks, north Victoria Land, Antarctica**, *Geologisches Jahrbuch, Reihe B*, 1984 No.60, German Antarctic North Victoria Land Expedition 1982/83, GANOVEX III, Vol.1, p.41-55, With German and Russian summaries. 25 refs.

A number of paleomagnetic investigations of Jurassic volcanic rocks from Antarctica carried out before 1981 gave a virtual geomagnetic pole (VGP) at about 55S, 220E. The paleomagnetic analysis of material from three sites at Litell Rocks collected during GANOVEX I (1979/80) surprisingly yielded a VGP near 76.9S, 201E. An investigation during the 1981/82 season of basaltic flows in the Mesa Range further south likewise resulted in an unexpected VGP near 64S, 210E. Resampling of Ferrar Volcanics at Litell Rocks by GANOVEX III confirmed the results of GANOVEX I. Additional material from dolerite outcrops in the Morozumi Range and sites east of Renick Glacier exhibited magnetization directions which fall into two groups with VGPs near 71S, 226E and 75S, 122E. It appears that the same duality of VGPs exists in northern Victoria Land as has been found in Mesozoic dolerites in Tasmania. The underlying cause of this duality is yet unknown. It is surely of significance that this occurs only in areas near the line of separation between Australia and Antarctica. (Auth.)

L-43818

Grushinskiĭ, A.N., Grushinskiĭ, N.P., **Gondwanaland and gravity anomalies**, *Geophysical journal*, May 1990 8(6), p.757-771, Translated from *Geofizicheskii zhurnal*. 14 refs.

Gravity anomalies and geoid heights are compared according to the conjugate contours of the continents in reconstructing the supercontinent Gondwanaland. It is found that the gravity anomalies are conserved and the geoid heights are often the same. It is conjectured that the breakup of Gondwanaland is manifested in the character of the gravitational field. (Auth.)

L-43878

Nobes, D.C., Mienert, J., Mwenifumbo, C.J., **Estimate of the heat flow on the Meteor Rise, subantarctic South Atlantic**, *Journal of geophysical research*, Apr. 10, 1991 96(B4), p.5947-5953, 17 refs.

Heat flow determinations require more than one reliable temperature measurement to obtain an estimate of the temperature gradient, and subsequently the heat flow. Two temperature readings were taken on leg 114 of the Ocean Drilling Program, both in hole 704B on the Meteor Rise in the subantarctic South Atlantic. One of these readings appears to be reliable, but the other appears to be invalid. The one reliable temperature measurement is used to calibrate the temperature derived from the induction resistivity log and the laboratory porosity measurements. The temperature and heat flow depend on the shape factor used in the modified Archie's law. The temperature gradient empirically obtained from the resistivity and porosity is 38 mK/m and the average heat flow is 64 mW/sq m, which is consistent with the age of the Meteor Rise (approximately 60 to 65 Ma). (Auth. mod.)

L-43917

Nogi, Y., Seama, N., Isezaki, N., Funaki, M., Kaminuma, K., **Measurement of geomagnetic field at sea during JARE-30, 1988-1989**, *Antarctic record*, Nov. 1990 34(3), p.346-356, In Japanese with English summary. 4 refs.

Three components and total intensity of the geomagnetic field were measured by STCM (Shipboard Three Components Magnetometer) and a proton magnetometer at the same time, in the Indian Ocean between latitudes 40N and 72S. The measurements of total

intensity by the proton magnetometer showed a variation of noise in harmony with the variation of ship's velocity, considered to be caused by instability of the sensor due to high velocity of the ship. The measurements of the three components of the geomagnetic field by STCM revealed short wavelength noises which were caused by slight yawing of the ship. Reliable absolute values of the three components were obtained by adapting the total intensity measured by a proton magnetometer to the data of three components measured by STCM. It is considered necessary to measure the three components and total intensity by STCM and a proton magnetometer simultaneously, to obtain the absolute values of the three components of the geomagnetic field. (Auth. mod.)

L-43974

Kuehner, S.M., Green, D.H., **Uplift history of the East Antarctic shield: constraints imposed by high-pressure experimental studies of Proterozoic mafic dykes**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.1-6, 22 refs.

The depths at which two suites of Proterozoic mafic dykes were emplaced within the Vestfold Hills were determined by using high-pressure experimental studies to reproduce the equilibrium phenocryst assemblage of their chilled margins. The results of these studies were then applied to chemically similar dykes exposed in the Napier Complex. This study indicates that, following the peak metamorphic event at about 3100 Ma, the Napier Complex and the Vestfold Hills experienced about 2000 m.y. of crustal stability. Both terranes followed identical isobaric cooling paths to about 2500 Ma, after which the Napier Complex remained at deep crustal levels (28 km) until about 1000 Ma, while the Vestfold Hills was exhumed at a net rate of 1 cm/1000 y until at least about 1360 Ma. This long period of crustal stability was terminated by a Himalayan-style tectonic event which resulted in isothermal decompression at minimum net rate of 1 cm/1000 y in the Napier Complex, while crustal loading depressed the Vestfold Hills from depths of about 16-22 km. In the absence of more recent deformational events, it is assumed that these terranes have experienced slow, erosion-controlled uplift since about 1000 Ma. (Auth. mod.)

L-43975

Harley, S.L., **Crustal evolution of some East Antarctic granulites**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.7-12, 22 refs.

Important metamorphic pressure-temperature-time (*P-T-t*) data and related features of granulites from the Archaean Napier Complex and Late Proterozoic metamorphic belt of East Antarctica are reviewed and their bearing on probable tectonic settings of metamorphism assessed. The high temperature metamorphism, near-isobaric cooling history and spatial distribution of *P-T* conditions in the Archaean Napier Complex are interpreted in terms of diffuse collisional tectonics, where an important late phase of extension of thickened crust has produced striking metamorphic features. This collision-extension model also involved extensive magmatism, induced in part by syn-extensional decompression and perhaps partial lithospheric detachment. The contrasting medium-temperature granulites of the Late Proterozoic complex, which show near-isothermal decompression *P-T* paths at mid-crustal levels, result from a collisional tectonic setting probably involving previously thinned crust, and with a heat source augmented locally by the addition of new magmas. The Archaean Napier Complex was underplated by 10-15 km of mainly younger crust in the Late Proterozoic, leading to its partial *en masse* uplift without significant retrogression or pervasive deformation. (Auth.)

L-44100

Ghidella, M.E., Raymond, C.A., LaBrecque, J.L., **Verification of crustal sources for satellite elevation magnetic anomalies in West Antarctica and the Weddell Sea and their regional tectonic implications**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.243-250, 29 refs.

The correlation has been investigated between dense aeromagnetic data and the Magsat satellite magnetic anomaly field for the region of the northern Antarctic Peninsula, South Shetland Is. and Bransfield Strait. It is demonstrated, via two- and three-dimensional models, that crustal structure variations arising from volcanic and plutonic activity related to palaeosubduction at the Pacific margin of the Antarctic Peninsula are the source of these satellite elevation anomalies. The ability to assign crustal sources to the satellite anomalies in this region has provided encouragement to extrapolate the modelling effort, on a regional scale, to the margin of West Antarctica and the Weddell Sea. Several interesting inferences can be drawn from this modelling, including the continuation of the Andean Intrusive Suite from the base of the Antarctic Peninsula to Thurston I., and the existence of a very broad region of anomalous oceanic crust at the Dronning Maud Land margin, adjacent to previously mapped seaward dipping reflectors. (Auth.)

L-44101

Garrett, S.W., **Aeromagnetic studies of crustal blocks and basins in West Antarctica: a review**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.251-256, 33 refs.

Topographical and geological data have led to the conceptual division of West Antarctica into discrete crustal blocks which are separated in places by large basins. Regional aeromagnetic data from the Weddell Sea sector of Antarctica support this approach. In general, large magnetic anomalies appear to be caused by Precambrian-Lower Palaeozoic crystalline basement and by Mesozoic-Cenozoic mafic intrusions. Disruptions of the magnetic pattern indicate major vertical and transcurrent displacements of the crustal fabric within, and at the margins of, the crustal blocks. (Auth.)

L-44104

Bosum, W., Damaske, D., Behrendt, J.C., Saltus, R., **Aeromagnetic survey of northern Victoria Land and the western Ross Sea during GANOVEX IV and a geophysical-geological interpretation**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.267-272, 3 refs.

In 1984-85 aeromagnetic investigations were carried out over an area extending from the East Antarctic shield, through the Transantarctic Mountains to the Ross Sea. The survey was planned as a conventional aeromagnetic survey, with relatively small distances (4.4 km) between profile lines and correspondingly low flight levels over the estimated depths of magnetic sources. This method enabled identification of large-scale anomalies and provided information on the smaller-scale magnetic patterns. Exact flight positioning was obtained using a special ground-based navigation system. As the area is located within the auroral zone, special attention was given to recording magnetic time variations. Profiles totalling 50,000 line kilometers were flown. The Victoria Land basin shows a distinct magnetic character, strongly supporting a graben-type structure within continental crust. To the north, an abrupt change in magnetic pat-

tern is marked by large circular anomalies. These are connected to a magnetic unit, the most impressive anomaly of which is the 'Polar 3 anomaly', extending about 150 km WSW-ENE, with amplitudes of up to 1600 nT. Farther west, over the polar plateau, the survey revealed features typical of cratonic areas. Some magnetic features over the partly exposed mountain areas can be correlated with known geological structures. (Auth.)

L-44107

Cooper, A.K., Davey, F.J., Hinz, K., **Crustal extension and origin of sedimentary basins beneath the Ross Sea and Ross Ice Shelf, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.285-291, 46 refs.

The Ross Sea is underlain by basement grabens filled with up to 8 km of high-velocity, (?) Mesozoic strata that are unconformably overlain by up to 6 km of flat-lying Cenozoic rocks. The 2-14 km thick sedimentary section is strongly deformed only in the Terror rift of the western Ross Sea. S-SE-trending positive gravity anomalies, probably marking locally thinner crust, coincide with the three major Ross Sea basement grabens, and continue over 1000 km beneath the Ross embayment. Offsets in gravity anomalies, structures and physiographic features of the Ross embayment region suggest that major transverse basement faults have controlled locations of horizontal and vertical displacements due to rifting. Crustal extension in the Ross embayment includes: (1) an early rift period ((?) late Mesozoic) of widespread graben downfaulting, crustal thinning, and later sediment infilling; and (2) a late rift period (Cenozoic) of more localized deformation, principally along the Transantarctic Mountains, Terror rift and in Marie Byrd Land. The change from widespread to more localized deformation may coincide with the documented Eocene change in oceanic plate motions.

L-44109

Behrendt, J.C., **Extensive volcanism and related tectonism beneath the western Ross Sea continental shelf, Antarctica: interpretation of an aeromagnetic survey**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.299-304, 12 refs.

A state of the art 50,000 km aeromagnetic survey, the first in Antarctica, was flown over northern Victoria Land and the western Ross Sea continental shelf in 1984-85. The aeromagnetic map indicates three discontinuous N-striking zones along the Terror rift in the Victoria Land basin (VLB) of about 100 short-wavelength (1-10 km), 20-500 nT anomalies that appear to be caused by submarine volcanoes and subvolcanic intrusions. The late Mesozoic(?) - Cenozoic VLB has an 80-100 km wide, 80-100 nT negative anomaly centered over the Terror rift that extends north from the Ross Ice Shelf for 300 km, probably caused by relief on the magnetic basement underlying the basin combined with the demagnetizing effect of an upwarped Curie isotherm associated with this active rift zone. The basement beneath the northern Coulman high bordering the VLB on the north is characterized by a number of 15-40 km wide anomalies having amplitudes >200 nT, including the 200 km long ENE-striking 1700 nT Polar 3 anomaly. These anomalies are probably caused by magnetic magmatic rocks buried in at least one case beneath the 1-2 km thick Cenozoic sedimentary section defined by seismic-reflection data. The Polar 3 anomaly may represent an offset in the Terror rift. The Central trough, a 6 km deep sedimentary basin, does not appear to have a significant long-wavelength magnetic anomaly. (Auth. mod.)

L-44111

Berg, J.H., **Geology, petrology and tectonic implications of crustal xenoliths in Cenozoic volcanic rocks of southern Victoria Land**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.311-315, 29 refs.

The Cenozoic volcanic rocks that were erupted in both the Ross embayment (RE) and adjacent Transantarctic Mountains (TM) of the McMurdo Sound region apparently brought to the surface inclusions representing essentially all levels of the crust, namely supracrustal (sandstone or dolerite), upper-crustal (granite, quartzite, schist, or marble) and lower-crustal (two-pyroxene, clinopyroxene, and ultramafic granulite) inclusions. The lower-crustal garnet- and spinel-bearing granulites yielded pressures and temperatures of equilibration that define an extremely high geothermal gradient for the Transantarctic Mountains and perhaps an even higher one for the Ross embayment. The pressures indicate a thicker TM crust (45-47 km) and a thinner RE crust (20-30 km). The high geothermal gradient is indicative of an active continental-rifting tectonic environment for the origin of the Ross embayment and Transantarctic Mountains. The absence of Beacon/Ferrar inclusions from most of the RE volcanic rocks is consistent with the hypothesis that these rocks are missing at least locally from the RE crust. This conclusion implies that uplift and erosion may have occurred in the Ross embayment region after the Jurassic and prior to the rifting and subsidence of the RE crust. (Auth.)

L-44134

Marks, K.M., Sandwell, D.T., Vogt, P.R., Hall, S.A., **Mantle downwelling beneath the Australian-Antarctic discordance zone: evidence from geoid height versus topography**, *Earth and planetary science letters*, Apr. 1991 103(1/4), p.325-338, Refs. p.337-338.

The Australian-Antarctic discordance zone (AAD) is an anomalously deep and rough segment of the southeastern Indian Ridge between 120-128E. A large, negative (deeper than predicted) depth anomaly is centered on the discordance, and a geoid low is evident upon removal of a low-order geoid model and the geoid height-age relation. Two models are investigated that may explain these anomalies: a deficiency in ridge-axis magma supply that produces thin oceanic crust (i.e. shallow Airy compensation), and a downwelling and/or cooler mantle beneath the AAD that results in deeper convective-type compensation. To distinguish between these models, the ratio was calculated of geoid height to topography from the slope of a best line fit by functional analysis (i.e. non-biased linear regression), a method that minimizes both geoid height and topography residuals. Average compensation depths of 27, 29, and 34 km, respectively, estimated from these ratios suggest a mantle structure that deepens towards the AAD. The deepest compensation (34 km) of the AAD is below the average depth of the base of the young lithosphere (about 30 km), and a downwelling of asthenospheric material is implied. (Auth. mod.)

L-44174

McGibbon, K.J., Wever, H.E., **Magnetic evidence for gabbroic plutons in the Black Coast area, Palmer Land (Extended abstract)**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.395-398, 9 refs.

This paper describes the magnetic anomalies along the Black Coast and discusses the geological importance of the gabbroic source rocks.

L-44176

Jones, J.A., Maslanyj, M.P., **Aeromagnetic study of southern Palmer Land and eastern Ellsworth Land**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.405-409, 15 refs.

Aeromagnetic data show southern Palmer Land and eastern Ellsworth Land to be characterized by broad (>20 km) anomalies which generally follow the arcuate structure of the area. Two-dimensional modelling studies suggest sources are large bodies buried at depths of between 5 and 12 km. High body magnetizations are required to reproduce observed anomalies, indicating that mafic plutonism may be more significant in the area than is apparent at outcrop. The West Coast Magnetic Anomaly, observed throughout Graham Land and northern Palmer Land, is seen to extend beyond 72S and, south of 73S, follows the curvature of the coastline. (Auth.)

L-44187

McGibbon, K.J., Smith, A.M., **New geophysical results and preliminary interpretation of crustal structure between the Antarctic Peninsula and Ellsworth Land**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.475-479, 13 refs.

New geophysical results from eastern Ellsworth Land have been combined with existing data to produce Bouguer-anomaly and bedrock maps of the region. The bedrock topography data confirm the morphological contrast between the Antarctic Peninsula and Haag Nunataks crustal blocks and the deep bedrock around Siple Station and Evans Ice Stream. Bouguer anomalies as low as -1300 gu characterize the Antarctic Peninsula as far south as a major bedrock scarp. To the southwest, Bouguer anomalies are dominantly positive with only gentle variations. Bedrock topography and Bouguer-anomaly data are used to draw preliminary conclusions about crustal structure in the area. They delimit the bedrock scarp at the southern end of the Antarctic Peninsula and distinguish areas of elevated bedrock from the Antarctic Peninsula crustal block. Farther southwest, previously proposed crustal fractures along deep subglacial troughs are not reflected on the Bouguer-anomaly map. Furthermore, elevated bedrock around Haag Nunataks and the Ellsworth Mountains shows little correlation with observed Bouguer anomalies. The reasons for the gently undulating positive Bouguer anomaly over this severe bedrock topography are briefly discussed, but clarification of crustal structure awaits further modelling. (Auth.)

L-44192

González-Ferrán, O., **Bransfield rift and its active volcanism**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.505-509, 17 refs.

During Plio-Pleistocene to Recent times, extensional processes were dominant in Bransfield Strait; these resulted in the formation of a series of NE-trending normal faults, which are subparallel to the northwestern margin of the Antarctic Peninsula and the opposite coast of the South Shetland Is. A qualitative examination of the aeromagnetic map of Bransfield Strait reveals a well-defined pattern of magnetic anomalies which is closely related to that of the normal faulting. These magnetic anomalies are interpreted as representing basic intrusions into the continental crust. The axis of the rift is defined by an offset spreading center, with which are associated the volcanoes of Deception, Penguin and Bridgeman Islands, and a number of submarine volcanoes. The rift has opened between 5 and 15 km since its inception at the end of the Pliocene. Thus, the spreading rate can be estimated at 0.25-0.75 cm/y. (Auth.)

L-44196

Maslanyj, M.P., **Geophysical investigation of George VI Sound, Antarctic Peninsula**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.527-530, 9 refs.

Northern and southern George VI Sound have quite different topographic, gravity and magnetic characteristics. The northern part is a deep (>800 m) elongated trough, which trends N-S and exhibits low Bouguer gravity and a quiet residual magnetic field. The southern part is a deeper (>1000 m) and broader trough, which trends E-W, with higher Bouguer gravity and a long wavelength (50 km), positive (300 nT) magnetic anomaly. The results suggest that George VI Sound is floored by a thick sequence of non-magnetic rock, and in the south is underlain by a magnetic body at an estimated depth of 8-13 km. In contrast to the north, southern George VI Sound exhibits local anomalies indicating variable shallow structure, which may include significant amounts of low-density sediments. If the geophysical features are related to crustal extension, then the evidence suggests that this was more pronounced in the south than in the north. One consistent model involves NW-directed movement of Alexander I. relative to the Antarctic Peninsula, and requires predominantly strike-slip motion in the north and extension in the south, although a more complicated history cannot be excluded. (Auth.)

L-44216

Marks, K.M., Sandwell, D.T., **Analysis of geoid height versus topography for oceanic plateaus and swells using nonbiased linear regression**, *Journal of geophysical research*, May 10, 1991 96(B5), p.8045-8055, 25 refs.

The relationship was investigated between geoid height and topography for 53 oceanic plateaus and swells to determine the mode of compensation. The ratio of geoid height to topography was obtained from the slope of a best line fit by functional analysis (i.e. nonbiased linear regression), a method that minimizes both geoid height and topography residuals. The Walvis Ridge, and the Agulhas, Crozet, and north Kerguelen plateaus have geoid/topography ratios and Moho depths that are consistent with the two-layer Airy model. The proximity of the Agulhas Plateau to a RRR triple junction during its early development, and the excessive volcanism at active spreading ridges that created the Crozet and north Kerguelen plateaus and the Walvis Ridge, may have produced regions of enhanced depletion and hence the low-density mantle anomalies. If this explanation is correct, then the low-density mantle anomaly persists over time and remains embedded in the lithosphere beneath the oceanic feature. (Auth. mod.)

L-44240

Peters, M., Haverkamp, B., Emmermann, R., Kohnen, H., Weber, K., **Palaeomagnetism, K-Ar dating and geodynamic setting of igneous rocks in western and central Neuschwabenland, Antarctica**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.549-555, 20 refs.

The Proterozoic country rocks at Ahlmannryggen consist of lava flows and sedimentary rocks intruded by sills (Borgmassivet Intrusives). These suites are intruded by dykes dated at about 1150 Ma. Palaeomagnetic data indicate that these magmatic rocks are all of Proterozoic age. Geochemical data indicate that they resemble modern tholeiitic island-arc suites. Locally they have a slaty cleavage grading into mylonitic texture which strikes parallel to the Jutulstraumen-Pencksökke(J-P) graben. Such tectonic structures were dated at 525 Ma using syntectonic white micas. Evidence for the initial break-up of Gondwana during the Jurassic is given by some 200 Ma

dykes in Ahlmannryggen and the 180 Ma lava flows, dykes and sills at Vestfjella. The mean pole position for the dykes in Ahlmannryggen and for the stratigraphically younger flows and cross-cutting dykes at Vestfjella is in good agreement with a mean Jurassic pole position for East Antarctica. The mean pole position for older lava flows at Vestfjella, however, has a significantly lower latitude and indicates an older age for these rocks. Whereas the Early Jurassic dykes in Ahlmannryggen have tholeiitic and subordinate alkaline affinities typical for continental rift magmatism, crustal contamination has obscured the affinities of the flows, dykes and sills at Vestfjella. (Auth.)

L-44241

Boyd, W.W., **Crustal evolution in the Pensacola Mountains: inferences from chemistry and petrology of the igneous rocks and nodule-bearing lamprophyre dykes**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.557-561, 21 refs.

Tholeiitic and calc-alkaline basalts are associated with late Precambrian-Mesozoic sedimentary rocks of the Pensacola Mountains. The majority of these intrusive and extrusive rocks are exposed in the central and northern ranges of the mountains. Late Precambrian dolerite sills also occur in the southern Patuxent Range, where Late Permian ultramafic lamprophyre dykes, bearing a varied suite of ultramafic and mafic nodules and megacrysts, intrude late Precambrian greywackes. Reference to the relevant experimental data for these lamprophyre assemblages as well as the basalts provides some constraints on speculation as to crustal evolution in the area. (Auth.)

L-44245

Bradshaw, J.D., **Cretaceous dispersion of Gondwana: continental and oceanic spreading in the south-west Pacific-antarctic sector**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.581-585, 36 refs.

The southwest Pacific sector differs from other areas in having large embayments and extensive submarine plateaux floored by thin continental crust. Current models of passive margin development suggest that such large thin crustal remnants are the result of major crustal extension. Consequently the crustal fragments are larger now than in the Mesozoic. This is particularly important in reassembly if it can be shown that some of the extension post-dates continental rupture. Partial closing of the embayments and reduction of the plateaux in proportion to their probable extension leads to a better reassembly. The revised assembly and the disparity of spreading rates between the south Tasman and southwest Pacific sectors suggests a major transform extending along the east side of the Iselin Bank and passing west of the Campbell Plateau. Crustal dispersion around the antarctic continental margin was accompanied by major extension within the continental crust, at least some of which clearly post-dates continental separation. Consequently reassemblies and plate-motion studies which rely wholly on geometric fit and magnetic lineation analysis are likely to be misleading. (Auth.)

L-44246

Storey, B.C., **Crustal blocks of West Antarctica within Gondwana: reconstruction and break-up model**, International Symposium on Antarctic Earth Sciences, 5th, Cambridge, Aug. 1987, Proceedings. Edited by M.R.A. Thomson, J.A. Crame, and J.W. Thomson, Cambridge, University Press, 1991, p.587-592, 29 refs.

A heterogeneous stretching model, incorporating simple shear, transcurrent motion and basin development, is used to reconstruct

West Antarctica within a Middle Jurassic Gondwana. Structural data, and a new interpretation of some of the subice topographic features, suggest no large-scale movement of the individual crustal blocks within West Antarctica. The main movement of these blocks has been accommodated by both stretching of the lithosphere between relatively solid blocks and by a large component of transcurrent motion. This stretching of the crust has produced discrete zones of thinner crust and a complex array of extensional rifts and pull-apart basins, and was accompanied by widespread magmatic activity. The transcurrent and extensional processes have changed the shape of West Antarctica since break-up; removal of both of these components is used to constrain the original position of the crustal fragments within Gondwana. (Auth.)

L-44384

Hamilton, N., **Mesozoic magnetostratigraphy of Maud Rise, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.255-260, 8 refs.

DLC QE39.T49b

A paleomagnetic investigation of the Late Cretaceous sediments of the Maud Rise recovered in holes 689B and 690C provides a fairly complete magnetostratigraphic record ranging from Chron C33N through Chron C29R. The Cretaceous/Tertiary boundary is shown to occur in Chron C29R at Site 690. (Auth.)

L-44385

Spiess, V., **Cenozoic magnetostratigraphy of Leg 113 drill sites, Maud Rise, Weddell Sea, Antarctica**, Proceedings of the Ocean Drilling Program, Vol.113, Scientific results, Weddell Sea, Antarctica, edited by D. Kennett, A. Masterson and N.J. Stewart, College Station, Texas A and M University, 1990, p.261-315, 13 refs.

DLC QE39.T49b

A detailed paleomagnetic study was carried out on biosiliceous and calcareous sediments drilled on Maud Rise, during ODP Leg 113. High-quality APC sections were retrieved in the upper 220 m of holes 689B and 690B. Average deposition rates range from 3 to 15 m/m.y. A close (25 cm) paleomagnetic sample spacing provided a medium-resolution magnetostratigraphic sequence for the Paleogene and Neogene. Paleomagnetic samples were demagnetized stepwise by alternating fields, and characteristic remanent magnetization directions were derived from detailed vector and difference vector component analysis. A magnetostratigraphic framework has been established for the first time for the southern ocean sedimentary sequences spanning Paleocene to Oligocene and middle Miocene to early Pliocene times. Good paleomagnetic correlation between the two holes is afforded in particular in the middle to upper Miocene. Oligocene magnetostratigraphy reveals a high-quality paleomagnetic record with a mostly complete Oligocene section in Hole 689B at about 5 m/m.y. deposition rate. Hole 690B exhibits higher deposition rates (7-12 m/m.y.), although two hiatuses are present. Early and late Eocene sedimentary sequences could be analyzed in both holes. (Auth. mod.)

L-44412

Nagao, T., Awara, M., Kaminuma, K., **Three-dimensional topographic and gravity anomaly maps in the vicinity of Mizuho Plateau, East Antarctica**, *Antarctic record*, Mar. 1991 35(1), p.56-69, In Japanese with English summary. 24 refs.

A re-compilation of gravity data around Showa Station was made to obtain three-dimensional contour maps of gravity anomalies and of ice sheet and bedrock topography. All gravity anomalies were re-calculated using the geoid height. The results are as follows: accuracy of gravity value determination is within 3 mgal; accuracy of free air anomaly is about 10 mgal; the result of bedrock elevation determina-

tion observed with radio echo sounding and that estimated from gravity data show good coincidence. However, a detailed comparison reveals many local discrepancies between the two results. Accurate determination of bedrock topography is one of the most significant factors for understanding the region. (Auth. mod.)

L-44414

Shibuya, K., **Status report for the development of the antarctic penetrator: No.1. 1989-year program**, *Antarctic record*, Mar. 1991 35(1), p.92-117, In Japanese with English summary. 15 refs.

The development of the antarctic penetrator, applicable to future seismic explosion experiments in the Sör Rondane Mountains region, is discussed. The planned observation system consists of the expendable ground system segment (GSS: penetrator) and the data collection segment (DCS) on the helicopter. In the 1989 program, 6 vertical-component seismometers (type V241-M), were made, and shock tests (acceleration ranging from -5000 G to 5000 G) were conducted. The sensors were proven to suffer no damage, with negligible change of the frequency characteristics. An IFP (Instantaneous Floating Point) amplifier and the digital recording program were designed, and the laboratory experiments with the above seismometers were made. Shock tests of the electronics parts such as quartz oscillator circuit, chemical battery, CPU, ROM, etc. were made to select appropriate units and to obtain the know-how of potting. Dummy penetrators were deployed from the hovering helicopter (AS 350B) 600 m above the glazed snow surface around Asuka Station; the parameter value of snow hardness was obtained. The telemetry method and the necessary commands for data acquisition and system diagnostics were examined. Direct transmitting VHF waves with 4-valued FM coded data may be applied as an aerial link. (Auth. mod.)

L-44470

Matthews, R.K., Frohlich, C., **Orbital forcing of low-frequency glacioeustasy**, *Journal of geophysical research*, Apr. 10, 1991 96(B4), p.6797-6803, 25 refs.

This paper proposes a geologic mechanism and realistic quantitative construct to explain how antarctic ice volume varies as a function of orbital forcing in the Tertiary. It is demonstrated that this mechanism, which has a nonlinear response to long-period modulation of the orbital-forcing time series, can produce major glacioeustatic events with quasi-periodicities of the order of 2 my. A FORTRAN program, STRATA-various, is used to construct a two-dimensional forward model demonstrating that this proposed mechanism can produce a synthetic sequence stratigraphy which bears strong resemblance to the generalizations of seismic sequence stratigraphy. It is proposed that the seismic sequence stratigraphy concepts of long-term and short-term eustatic curves be replaced by independent estimates of tectonoeustasy and glacioeustasy, based upon data sets which are, wherever possible, independent of seismic sequence stratigraphy. It is also proposed that qualitative generalizations be replaced with explicit forward models as the targets for model/data convergence. (Auth. mod.)

L-44664

Wagner, S., Lindner, H., **Interpretation of geomagnetic anomalies in Dronning Maud Land, East Antarctica**, *Antarctic science*, Sep. 1991 3(3), p.317-321, 10 refs.

The geomagnetic field pattern in the vicinity of Georg Forster Station is discussed. Induced magnetization is assumed to model the regional minimum in the total field intensity (MAGSAT) located here, and an associated anomalous body at a depth of 50 km is calculated and interpreted. This model is, however, discounted in favor of a cross section derived from a meridional ground magnetic profile recorded over a distance of about 200 km. The most striking features of the profile are positive anomalies over the ice shelf, which are

explained by dykes of basic rocks emanating from the lower crust and from the mantle. The derived crustal structure reflects a transition from continental crust to transitional type crust. (Auth.)

L-44719

Von Frese, R.R.B., Jones, M.B., **Gravity and magnetic exploration of the seafloor**, *Sea technology*, Sep. 1991 32(9), p.10-22, 4 refs.

The seafloor from the base of the water column to the uppermost mantle records the geological evolution of the oceans and continents over roughly the past 200 million years. In addition, the seafloor records the development of basins, trenches, ridges and rises, plateaus, hotspots, fracture systems, and many other features, which is important to understand for new insight on plate tectonics, earthquake hazards, and the distribution of energy and mineral resources. The seafloor represents more than 70% of the earth's crust. Its geological and archaeological features for the most part cannot be studied directly due to the cover of marine water. These features, however, are commonly characterized by density and/or magnetic property variations within the seafloor which can be mapped, respectively, by gravity and/or magnetic surveying. This fact coupled with the tremendous technological advances which have occurred since the second world war make the gravity and particularly the magnetic method the most cost-efficient exploration techniques available for imaging seafloor features at nearly any scale. The article provides a brief survey of how and why physical information about the seafloor is gathered, how the gathering is accomplished, and what costs are involved. Data on Antarctica are included. (Auth. mod.)

L-44767

Takenaka, J., Yanagisawa, M., Fujii, R., Shibuya, K., **Crustal magnetic anomalies in the antarctic region detected by MAGSAT**, *Journal of geomagnetism and geoelectricity*, 1991 43(6), p.525-538, 23 refs.

Crustal magnetic anomalies in the antarctic region were studied with the MAGSAT CHRONFIN data of 1790 passes. The GSFC(12/83) model was used to reduce the earth's core field to estimate the residual magnetic field. Obtained residual intensity data in the geomagnetic coordinates were averaged over 1 hour magnetic local time (MLT) and 1 deg. invariant latitude, and then grouped by taking the planetary magnetic activity index (Kp) as a parameter to derive the Mean Polar Disturbance Fields (MPDFs). The anomalies in the oceanic area are negative for abyssal plains, while they are positive for ridges and plateaus. The tectonically active Scotia Sea microplate region is associated with negative anomalies. Land areas of Antarctica are characterized by three positive anomalies over Enderby Land, Gamburtsev Subglacial Mountains and Wilkes Land. Negative land anomalies are also definitely related to geologic provinces such as Queen Maud Land, Queen Mary Land, etc., but a detailed interpretation of overall magnetic anomaly pattern requires more comprehensive geological and geophysical studies. (Auth. mod.)

L-44892

Zhang, P., Jiao, C.M., Liu, C.F., **Construction of the geomagnetic observatory at the Great Wall Station on Antarctica**, *Antarctic research*, 1991 3(1), p.59-62, In Chinese with English summary. 12 refs.

The geomagnetic observatory at the Great Wall Station was built in Mar., 1987, and it consists of observation and recording rooms and various sensors. The buildings are made of nonmagnetic thermal insulation materials, are structurally strong for resistance to powerful winds, and rest on stilts for protection against snowdrifts. Routine observations of the geomagnetic field around the station, and recordings of the geomagnetic fluctuations during the year, are carried out. (Auth. mod.)

L-44926

Kaminuma, K., **Local earthquake activities around Syowa Station, East Antarctica, Tohoku University. Science reports. Series 5. Geophysics**, 1990 32(3-4), p.127-136, 17 refs.

Nine local earthquakes of magnitude up to 3.0 were detected by the tripartite seismic network at Showa Station during 16 months, from June 1987 to Sep. 1988. The earthquakes were located in the coastal area of the antarctic continent and offshore. As the crustal uplift caused by deglaciation continues at a rate of more than 2.5 mm/y, the local earthquakes seem to be caused by the tectonic stress which is accumulated by the crustal uplift. (Auth.)

L-45004

Nobes, D.C., Mienert, J., Mwenifumbo, C.J., Blangy, J.P., **Estimate of heat flow on the Meteor Rise, Site 704**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, Subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.39-45, 13 refs.

DLC QE39.T49b Vol.114 1987

Two temperature readings were taken on ODP Leg 114, both in Hole 704B. One of these readings appears to be reliable, but the other may not be valid. Using the two temperature measurements, the temperature gradient is 20 mK/m and the computed heat flow is 32 mW/sq m. Alternatively, the one reliable temperature measurement can be used to calibrate the temperature derived from the resistivity and porosity. The temperature and heat flow computed for individual units can be different, and depend on the shape factor used in the modified Archie's law. The temperature gradient obtained from the resistivity and porosity is 38 mK/m and the average heat flow is 60 mW/sq m, which is consistent with the age of the Meteor Rise. These values are also consistent with the heat flow that is computed, assuming a simple linear temperature gradient from the seafloor through the sediment section. (Auth. mod.)

L-45020

Hailwood, E.A., Clement, B.M., **Magnetostratigraphy of Sites 699 and 700, East Georgia Basin**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.337-357, 10 refs.

DLC QE39.T49b Vol.114 1987

ODP Sites 699 and 700 were drilled within the East Georgia Basin primarily to explore the paleoceanographic and sedimentary history of this region during the early stages of separation of South America from Africa and Antarctica. Determination of the timing of the various events represented in the sedimentary record of these sites requires the establishment of a high-resolution stratigraphic framework. This was achieved through combined magnetostratigraphic/biostratigraphic studies of the sediments recovered from Holes 699A and 700B. The magnetostratigraphic data are presented in this paper. They are based on a combination of shipboard whole-core paleomagnetic determinations made at 10 cm intervals on all archive core halves, and involving AF demagnetization in fields of 5 and/or 9 mT together with shipboard and post-cruise incremental AF demagnetization analyses of some 450 discrete samples. A generally continuous magnetostratigraphic record has been obtained for the Pliocene-Pleistocene and Oligocene sequences recovered from Hole 699A. A record of the Brunhes, Matuyama, and late Gauss Chrons has been identified in the Pleistocene to late Pliocene age sediments cored in the upper 30 m section of this hole. However, interpretation of the magnetostratigraphic record observed for the Pliocene sediments in the interval from 30 to 70 mbsf is complicated by the possible presence of hiatuses. The sedimentary sequence recovered from Hole 700B extends from the middle Eocene through to the Coniacian or Turonian stages. The magnetostratigraphic record for the Eocene

part of this sequence is fragmentary, but chonal assignments can be made for certain isolated parts of the section. Biostratigraphic (nannofossil) data indicate that a hiatus may be present at the Cretaceous/Tertiary boundary. (Auth. mod.)

L-45021

Clement, B.M., Hailwood, E.A., **Magnetostratigraphy of sediments from Sites 701-702**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.359-366, 14 refs.

DLC QE39.T49b Vol.114 1987

During Leg 114 of the Ocean Drilling Program 12 holes were drilled at seven sites in the subantarctic South Atlantic Ocean. A major objective of this cruise was to document the development of the deep-water passageway that formed as the Meteor and Islas Orcadas rises rifted and spread apart. The results are reported of a magnetostratigraphic study of the sediments recovered at Site 701, a deep-water site located within the gateway, and Site 702, a shallow-water site located near the crest of the Islas Orcadas Rise. The sequence of Pliocene-Pleistocene reversals observed at Site 701 is readily correlated with the Brunhes Chron through Chron C3A. Although correlation is more difficult in the older sections at Site 701 because of coring gaps and the lack of tight biostratigraphic control, it is possible to correlate the late Miocene sequence of reversals with Chrons C4A and C5. The polarity sequence observed in the very weakly magnetized middle to upper Eocene nannofossil chinks recovered from Hole 702B is correlated with Chrons C18 through C21. The correlation of the polarity sequences at these two sites provides a temporal framework for these sediments and makes it possible to calibrate southern high-latitude biostratigraphic datums to the geomagnetic polarity time scale. (Auth.)

L-45022

Hailwood, E.A., Clement, B.M., **Magnetostratigraphy of Sites 703 and 704, Meteor Rise, southeastern South Atlantic**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.367-386, 22 refs.

DLC QE39.T49b Vol.114 1987

ODP Sites 703 and 704 were drilled near the crest of the Meteor Rise in the southeastern part of the South Atlantic in order to explore the role of this aseismic rise as a barrier to the flow of deep water between the Antarctic and South Atlantic during the early evolution of the South Atlantic, and to investigate the subsequent subsidence and paleoceanographic evolution of this area. A combination of shipboard whole-core paleomagnetic determinations on all archive core halves and post-cruise paleomagnetic analyses of some 440 discrete samples from the two sites has allowed definition of the sequence of geomagnetic polarity reversals that occurred during deposition of much of this sedimentary sequence. The magnetostratigraphic record for Site 703 extends from the middle Eocene to the early Miocene and that for Site 704 from the early Miocene to the Pleistocene. The correlation of this record to the standard geomagnetic polarity time scale of Berggren et al. (1985) is generally good for the Oligocene and late Miocene to Pleistocene, but is poorer for the early and middle Miocene. The combined magnetostratigraphic record for these two sites will facilitate the development and chronometric calibration of refined high-latitude biostratigraphic zonations. Furthermore, it provides an important basis for defining the periodicity of late Neogene stable isotope and carbonate fluctuations observed in these cores and relating these changes to the paleoclimatic and paleoceanographic driving forces. (Auth.)

L-45023

Hailwood, E.A., Vashisht, N., **Paleomagnetism of igneous rocks drilled on Leg 114**, Proceedings of the Ocean Drilling Program, Vol.114, Scientific results, subantarctic South Atlantic, edited by E.K. Mazzullo, College Station, TX, Texas A and M University, 1991, p.387-406, 15 refs.

DLC QE39.T49b Vol.114 1987

A paleomagnetic study was made of 12 samples of trachytic basalt from the base of ODP Hole 698A on the Northeast Georgia Rise (southwest Atlantic) and four samples of andesitic basalt and nine samples of volcanic breccia from the base of ODP Hole 703A on the Meteor Rise (southeast Atlantic). The results support the interpretation of the Hole 698A basalts as true oceanic basement of Late Cretaceous age rather than a younger intrusion. Well-defined stable components of magnetization were identified from AF and thermal demagnetization of the Hole 698A basalts, and less well-defined components were identified for the Hole 703A samples. Studies of the magnetic homogeneity of the Hole 698A basalts, involving harmonic analysis of the spinner magnetometer output, indicate the presence of an unevenly distributed low-coercivity component superimposed on the more homogeneous high-coercivity characteristic magnetization. The former component is believed to reside in irregularly distributed multidomain magnetite grains formed along cracks within the basalt, whilst the latter resides in more uniformly distributed finer magnetic grains. The inclination values for the high-coercivity magnetization of five Hole 698A basalt samples form an internally consistent set with a mean value of 59 deg. The corresponding Late Cretaceous paleolatitude of 40 deg is shallower than expected for this site. The polarity of the stable characteristic magnetization of the Site 698 basalts is normal. (Auth. mod.)

L-45055

Akamatsu, J., **Coda attenuation in the Lützow-Holm Bay region, East Antarctica**, *Physics of the Earth and planetary interiors*, May 1991 67(1-2), p.65-75, Refs. p.74-75.

The frequency-dependent coda $1/Q_c$ was estimated for the Lützow-Holm Bay region on the basis of the single-scattering model, and discussed together with $1/Q_c$ data of Kyoto, Japan, as an example of an active region. Coda waves from six shallow earthquakes, observed with a local telemetry seismic network installed along the Soya Coast, were analyzed with narrow band-pass filters. $1/Q_c$ for a lapse time of 20-40 s was estimated. In comparison with $1/Q_c$ data for Kyoto and other regions with various tectonic conditions, $1/Q_c$ in the Lützow-Holm Bay region was characterized by large values at low frequency (around 1 Hz) and smaller values at higher frequency. From the single-scattering model, $1/Q_c$ suggests a strong frequency dependence of intrinsic absorption for S waves. Assuming that the observed $1/Q_c$ reflects scattering loss of energy, and taking account of the geological conditions and the extremely low seismic activity in East Antarctica's continental shield, it is suggested that the frequency-dependent $1/Q_c$ is attributable to large scattering loss in the lower-frequency range caused by large-scale heterogeneities as a result of velocity and/or density perturbations. (Auth. mod.)

See also:

A-43973 E-43251 E-43285 E-43291 E-43360 E-43361 E-43698
E-43965 E-43978 E-43983 E-43990 E-44001 E-44057 E-44102
E-44110 E-44170 E-44191 E-44215 E-44368 E-44614 E-44618
E-44737 E-44739 E-44927 F-43366 F-43367 F-43368 J-44364
J-44366

M. POLITICAL GEOGRAPHY

M-43074

Coles, P., Aldhous, P., Anderson, C., Anderson, A., **Chilean funeral for antarctic minerals pact**, *Nature*, Nov. 22, 1990 348(6299), p.269.

The report presents a discussion of some proposed alternative solutions to the prospect of mineral exploration of Antarctica. The minerals regime convention seems to have failed with the adamant rejection of it by France and Australia. A proposal by them, with Belgium and Italy as co-sponsors, set for a meeting of the Antarctic Treaty Consultative Parties in Santiago, Chile in Dec., would set aside Antarctica as a natural preserve and a "land of science." The British, distrustful of vague labels, are expected to suggest a new protocol to the Antarctic Treaty, giving specific ways by which to protect the antarctic environment. The U.S. team has agreed to consider some sort of moratorium on antarctic mining activity. Scientists and environmentalists are in full accord on one issue: the primary threat to the antarctic environment is not mineral exploration but burgeoning tourist visitations.

M-43076

Boggs, S.W., **Polar regions: geographical and historical data for consideration in a study of claims to sovereignty in the arctic and antarctic regions**, Buffalo, New York, William S. Hein & Co., Inc., 1990, 123p., LCCN 89-85449, Refs. passim.

Mr. Boggs was appointed Geographer for the Department of State in 1924 following his award of the Master's Degree in Geography from Columbia University. He became an expert, and provided advice to the Department, on such technical matters as boundary disputes, correct usage of geographical names, and the bases for national claims to sovereignty, particularly in disputed areas. The present work was written in 1933 and is assumed to have been presented orally. The memorandum was intended to present the most important facts and ideas relating to polar regions, for use in consideration of the political and legal problems involved in formulating a more definite national policy regarding the arctic and antarctic areas. The manuscript was found in 1988 among the backlog of uncataloged materials in the collection of the Appellate Division Law Library in Rochester, NY. Political and legal problems relating to the polar regions which were identified by the author in 1933 have yet to be confronted in 1990.

M-43117

Holdgate, M.W., **Antarctica: ice under pressure**, *Environment*, Oct. 1990 32(8), p.5-9, 30-33, 10 refs.

This review briefly describes the antarctic locale and its physical features; human impacts through whaling and sealing expeditions; aspects of discovery and territorial claims; the beginning and growth of scientific programs, and the promulgation of the Antarctic Treaty following the scientific success of the IGY. The development of the Antarctic Treaty into a system with the negotiation of various Conventions and the proliferation of consultative parties as interest grows in the potential of natural resources are significant aspects of a continuing effort to protect the antarctic environment. There is full agreement on the concept but many differences on ways and means of achieving it. The most recent disagreement is the Convention to establish a minerals regime (CRAMRA) which is opposed by staunch environmentalists who insist on world park status for Antarctica. In the midst of these instabilities the author suggests a role for the IUCN in which it would help establish goals for Antarctica rather than seek or prescribe solutions to opposing views.

M-43148

Child, J., **'Latin lebensraum': the geopolitics of Ibero-American Antarctica**, *Applied geography*, Oct. 1990 10(4), p.287-305, Refs. p.302-305.

During the 1980s the concept of an 'Ibero-American quadrant' of Antarctica, located between 0 and 90W, acquired growing acceptance in Latin America and Spain. Within this quadrant Argentina and Chile possess long-standing sovereignty claims, while more recently other Latin countries (Brazil, Cuba, Ecuador, Peru, Spain and Uruguay) have established presences therein. The long-standing geopolitical tradition in South America provides the foundation for the contemporary and future geopolitical perceptions held about Antarctica by individual South American countries. A significant trend relates to the emergence of a cooperative and integrative form of geopolitical thought in place of a more traditional nationalist and aggressive approach. Nevertheless, the concept of Ibero-American cooperation, though possessing the potential of enhancing the effectiveness of individual antarctic programs, raises the possibility of ranging Ibero-Latin American countries against other states involved in Antarctica. (Auth. mod.)

M-43149

Joyner, C.C., **Maritime zones in the southern ocean: problems concerning the correspondence of natural and legal maritime zones**, *Applied geography*, Oct. 1990 10(4), p.307-325, Refs. p.324-325.

A significant body of international law drafted simultaneously but separately for the Antarctic Treaty system (ATS) and the law of the sea affects the southern ocean. Although this ocean is characterized by several distinct geophysical zones, it is not easy to secure a consensus regarding an appropriate northern boundary. The law of the sea defines a series of maritime jurisdictional zones, whose application to Antarctica is hindered by the region's continuing uncertain legal status. Nevertheless, the antarctic relevance of the law of the sea raises a number of interesting questions, while highlighting the fact that legal zones in Antarctica have often developed without taking full account of geographical criteria. An understanding of geographical and other factors facilitates an improved understanding of the need for new legal approaches designed to regulate antarctic activities in a more equitable and effective manner. (Auth.)

M-43432

Herr, R.A., ed, Hall, H.R., ed, Haward, M.G., ed, **Antarctica's future: continuity or change?**, Hobart, Tasmania, Australian Institute of International Affairs, 1990, 338p., For individual papers see A-43433 through A-43441, A-43443 through A-43446, M-43442, M-43447, and M-43448.

This volume of 15 chapters is a collection of papers and addresses presented at a conference hosted by the Australian Institute of International Affairs, held in Hobart, Tasmania, Nov. 18-19, 1989. Each chapter captures the essence of the debate on the future of Antarctica, including the challenge to reform the Antarctic Treaty System, the image of Antarctica as a continent of science, the question of antarctic resources and conservation of the environment, and the likely impact of sovereignty as an issue for the future of Antarctica. Four appendices include the entire text of the Antarctic Treaty, the Convention for the Conservation of Antarctic Seals, the Convention on the Conservation of Antarctic Marine Living Resources, and the Convention for the Regulation of Antarctic Mineral Resource Activities.

M-43442

Scully, R.T., **Antarctic Treaty as a system**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.95-102.

The Antarctic Treaty System is addressed from three perspectives: first, in terms of its components; second, viewed as a mechanism for governance, as a means of dealing with activities; and third, at what lies ahead. Here, three major questions facing the system are pointed out: the question of the Antarctic Minerals Convention, whether there is a need to have a mechanism in place to deal with the situation in which serious interest in antarctic mineral activities might emerge; the question of how to deal with the completion of the infrastructure of the Treaty System itself; and the question of how to ensure not to compromise the value of Antarctica in its role as a laboratory for studying global processes.

M-43447

Beck, P.J., **Antarctic as a zone of peace: a strategic irrelevance? A historical and contemporary survey**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.193-224, 96 refs.

Antarctica's strategic role from 1900 to 1959, the signing of the Antarctic Treaty and the contemporary significance of the Treaty are discussed, with the following conclusion: the Treaty's Articles I, V and VII, reinforced by Article IV's freeze on the sovereignty problem, protect the whole treaty area against strategic and other pressures liable to undermine its *de facto* neutralization. From the point of view of both antarctic and global peace, Antarctica's strategic irrelevance has proved beneficial, while the fact that the Treaty may last indefinitely assures the permanence of this state of affairs.

M-43448

Hemmings, A.D., **Is Antarctica demilitarised**, Antarctica's future: continuity or change? Edited by R.A. Herr, H.R. Hall and M.G. Haward, Hobart, Tasmania, Australian Institute of International Affairs, 1990, p.225-241, 46 refs.

A critical assessment of this paper is that for the 1990s and beyond, the continuation and refinement of Antarctica as a demilitarized zone will require something more than current arrangements. Periodic inspections in Antarctica are no longer enough. Far more rigorous assessments of other nations' research in Antarctica need to be made in the home country, where the resources are available, to evaluate not only the specific program, but the scientific and military context in which it may have significance.

M-43451

Kimball, L., **Report on Antarctica**, Washington, D.C., World Resources Institute, 1991, 34p.

The eleventh special ATCM took place in Vina del Mar, Chile, Nov. 19 to Dec. 6, 1990. It established two working groups of the whole, one focusing on the structure and components of a comprehensive system for environmental protection in Antarctica and the other on the review and strengthening of existing measures. Informal discussions were organized to find an acceptable compromise on how to deal with the possibility of minerals development in Antarctica. The meeting produced an informal draft Protocol to the Antarctic Treaty and four draft annexes. These documents are attached to the interim report of the XI special ATCM, and are to serve as the basis for negotiation at a further session of the special ATCM scheduled for Apr. 1991 in Madrid, Spain. While the informal nature of the Protocol and its annexes is such that all parties effectively reserve their positions on the form and content of a new legal instrument on comprehensive environmental protection, there is widespread support for the Protocol with annexes approach, and for concluding the instru-

ment during 1991 and adopting it at the sixteenth regular ATCM, which takes place in Bonn in Oct. 1991. The discussion of the Protocol is organized in paraphrased summaries of a half-dozen major issues and a full dozen major components of the Decision-Making issue. In a series of author's notes, the latter group is explicated and interpreted. The Protocol is reproduced in Appendix 2.

M-43468

McClintock, R.B., Simester, A.P., **Legal imperatives for environmental policy in the Antarctic**, Antarctica 150: scientific perspectives, policy futures. Edited by J.E. Hay, A.D. Hemmings and N.G. Thom, Auckland, University of Auckland, 1990, p.67-74, Refs. p.72-74.

The problems of specifying environmental rules for the Antarctic are discussed. The present law relating to the antarctic environment is outlined; provisions of the Antarctic Treaty System are incomplete; application of law both to States party to the Antarctic Treaty and to third States is uncertain; and provisions of general international environmental law are insufficiently defined to give comprehensive protection. The Convention on the Regulation of Antarctic Mineral Resource Activities, while addressing difficulties of environmental protection, appears unlikely to enter into force. Methods with which to bind States to an environmental treaty are considered, using the World Park proposal as an example. These include territorial sovereignty, conventional protection and development of customary law for the region. Each method carries with it defects in law. (Auth. mod.)

M-43595

Beck, P.J., **Resource conventions implemented: consequences for the sovereignty issue**, *International challenges*, 1990 10(1), p.56-60.

The Antarctic Treaty Consultative Parties (ATCPs) interpret the Antarctic Treaty System (ATS) as a way of avoiding the unmanageable escalation of national policy interests at variance with each other. From this point of view it might be argued that the claimants, like other parties, have more to gain from the maintenance of the ATS than from the pursuit of unrealistic, unenforceable sovereignty claims. At some future date the sovereignty issue might have to be faced, if not resolved, but it is appreciated that as long as the Treaty survives the problem remains just below the surface. Indeed, this point encourages most ATCPs to favor the ATS' indefinite duration.

M-43599

Bos, A., **Consultative status under the Antarctic Treaty: redefining the criteria?**, *International challenges*, 1990 10(1), p.73-77.

After a discussion which supports the view that the antarctic cooperation regime is increasingly displaying the characteristics of an international organization, it is suggested that it would be appropriate to establish a body, on the lines of the Special Meeting provided for in article 40(3) of the CRAMRA, with a remit embracing the antarctic system as a whole. This would create a forum in which all state parties could take part on an equal footing, and thus help to give more substance to the position of non-Consultative Parties.

M-43600

Safronchuk, V.S., **Relationship between the ATS and LOS Convention of 1982**, *International challenges*, 1990 10(1), p.78-80.

Deliberations in the UN General Assembly on the question of Antarctica are chronologically summarized and placed into three somewhat overlapping phases, with the conclusion that the third phase will likely turn on the elaboration of a "comprehensive environmental regime". This concept has already been supported by a number of ATS Consultative Parties as well as members outside the Sys-

tem. Such an approach will eventually establish a firm environmental link between the ATS and the LOS Convention.

M-43603

Falk, R., **Antarctica Treaty System: are there viable alternatives**, *International challenges*, 1990 10(1), p.91-93.

In evaluating an overall situation of growing complexity, concerning developments which have eroded confidence in the adequacy of ATS, several conclusions are drawn: ATS is itself an idealistic innovation that has been responsive to world community concerns and has built up a generally positive reputation; ATS is a flexible format that has yet to provide evidence of an inability to meet new challenges; ATS will be hard to supersede by an alternative regime for both technical and political reasons, and its collapse could lead to an overall deterioration in cooperation and environmental protection.

M-43627

Klotz, F.G., **America on the ice: Antarctic policy issues**, Washington, D.C., National Defense University Press, 1990, 345p., Refs. p.319-326.

The author examines Antarctica before the 1959 Treaty, and then scrutinizes the operation of the treaty itself. He notes that three significant challenges to continued cooperation in the Antarctic have arisen despite 30 years of international cooperation. First, as the world has become more aware of dwindling natural resources, the modest discoveries in the Antarctic are attracting more attention. Second, certain nations, not signatories to the Treaty, have questioned the right of the Treaty members to control resource development. Third, disputes over territorial sovereignty remain to be resolved. As competition for resources increases, the issue of who owns the Antarctic could lead to contention. This study provides a framework for crafting a U.S. strategy on these emerging antarctic issues.

M-43718

Beck, P., **Australia's new course in Antarctica**, *Australian Centre for Maritime Studies Incorporated. Occasional Papers in Maritime Affairs*, 1990 No.6, Australia's maritime interests: views from overseas, edited by W.S.G. Bateman and M.W. Ward, p.102-119, 52 refs.

Between 1988-90 the Australian government's approach on CRAMRA inaugurated a 'new course' in antarctic policy. The region became a major element in government policy for both intrinsic and global reasons. The Hawke government adopted a leadership role in the Antarctic Treaty system on the minerals question in place of its traditional low key reactive strategy. CRAMRA forced Australia to reconsider its antarctic policy options and priorities in the light of new realities. But any emphasis upon change, including the enhanced environmental dimension, should not obscure policy continuities. The report begins with the announcement by the Australian Prime Minister that Australia's support of a minerals regime in Antarctica is withdrawn and that instead, Australia will pursue a policy to ban all mining in Antarctica and to secure the establishment of an antarctic Wilderness Park. Details of the events over a two year period preceding and leading to this announcement provide the background for understanding a major shift in Australian endeavors in Antarctica. (Auth. mod.)

M-44159

Scully, R.T., **Eleventh Antarctic Treaty Special Consultative Meeting**, *International challenges*, 1991 11(1), p.77-90.

The Eleventh Antarctic Treaty Special Consultative Meeting (SCM XI) took place Nov. 19 to Dec. 6, 1990 in Vina del Mar, Chile. Delegations participated from the twenty-six Antarctic Treaty Consultative Parties (ATCPs). In the period leading up to SCM XI, three draft proposals were circulated: an indicative draft of a convention for the comprehensive protection of the antarctic environment, jointly

submitted by Australia, Belgium, France and Italy; a draft protocol to the Antarctic Treaty on environmental protection, submitted by New Zealand; and comprehensive measures for the protection of the antarctic environment and its dependent and associated ecosystems: an outline of a protocol supplementing the Antarctic Treaty, jointly submitted by Argentina, Norway, the U.K., the U.S.A. and Uruguay. Two Working Groups were established: Working Group I was designated to draft compromise texts on several specific issues, but its primary value lay in clarifying and exploring the substantive divergences among the proposed agreements. Working Group II concerned itself with a detailed and far-reaching review of specific environmental protection measures. Based on the debate in Working Group I and following completion of its substantive work, Rolf Trolle Andersen, head of the delegation of Norway, undertook, on a personal basis, to merge the approaches reflected in the proposed draft agreements into a single compromise negotiating text. The resulting Andersen text, prepared and once revised after extensive informal consultations, received universal support as the basis for future work, with a widespread view that it represents the basis for reaching agreement in 1991. The Andersen text—the Protocol to the Antarctic Treaty on Environmental Protection—incorporates the protocol with annexes approach, and includes a broad range of substantive provisions for which major details are provided.

M-44394

Joyner, C.C., **Comparison of Soviet arctic and antarctic policies**, Soviet maritime arctic. Edited by L.W. Brigham, London, Belhaven Press, 1991, p.284-299, 27 refs.

Three issues lend particular insight into the Soviet government's perception of its national interest priorities for the respective poles, the evolution of policies formulated to attain those priorities, and the geostrategic importance which subsequently has become affixed to them. First, there is the Soviet Union's legal attitude towards territorial claims and sovereignty considerations in both polar regions. Second, there is the process and means of conducting scientific research activities and the respective rationale for undertaking those activities in each pole. Third, there is the package of policies formulated to deal with managing and exploiting both living and non-living natural resources in the polar regions. When taken together, these issues indicate that certain geostrategic and geopolitical objectives are implicit in the Soviet Union's disparate polar policy. The nature of those policies and the implications they pose for international relations are addressed here. (Auth.)

M-44418

Beck, P.J., **Antarctica, Viña del Mar and the 1990 UN debate**, *Polar record*, July 1991 27(162), p.211-216, 37 refs.

The XIth Antarctic Treaty Special Consultative Meeting in Viña del Mar, Chile (Nov. 19 to Dec. 6, 1990) aired the Antarctic Treaty Consultative Parties' views on conservation, following the collapse of support for the minerals convention. Almost simultaneously at the United Nations Assembly in New York, the eighth successive annual discussion on Antarctica included the usual critique of the Treaty System's political and legal framework. The conservationist emphasis apparent in 1989 continued in 1990, accompanied by an attack on antarctic science. Particular emphasis was placed on adverse environmental impacts from the crowding together of scientific stations. Treaty parties countered with their long-standing opposition to UN interference in Treaty matters. Resolutions on Antarctica sought to exclude South Africa from ATS activities and to consider the establishment of a UN international research station. The 1990 discussions showed that the Treaty System at its 30th anniversary fails to enjoy universal support, and contributed to an emerging debate on the merits of antarctic science. (Auth.)

M-44483

Rothwell, D.R., **Antarctic Treaty System: resource development, environmental protection or disintegration**, *Arctic*, Sep. 1990 43(3), p.284-291, With French summary. 40 refs.

The Antarctic Treaty System has successfully managed Antarctica and the surrounding southern ocean since 1961 despite the existence of conflicting sovereignty claims and calls from the Third World for greater international participation in the continent's management. The spectre of unregulated mining activities in Antarctica caused the parties to the Antarctic Treaty to negotiate the Convention for the Regulation of Antarctic Mineral Resource Activities in 1988. However, the entry into force of the convention is now being challenged by Australia and France, who propose a prohibition on mining in Antarctica and favor the negotiation of a comprehensive environmental protection regime for the Antarctic. The development of a world park in Antarctica has been mooted since 1972, and during the 1980s various international environmental organizations gave enthusiastic support to the concept. A meeting of the Antarctic Treaty Consultative Parties in 1989 resolved to further discuss in 1990 the implementation of comprehensive environmental protection measures in Antarctica. While 1990 may be a pivotal year in the current debate over the environmental future of Antarctica, 1991 is potentially more significant, as the Antarctic Treaty will then become eligible for a comprehensive review. This raises the prospect of substantial changes to the antarctic regime. (Auth.)

M-44520

Beck, P.J., **Canada as a bi-polar power: Canada's antarctic dimension**, *Lakehead University. Centre for northern studies. Occasional paper*, 1991 No.7, 50p., 136 refs.

Canada's polar role is defined primarily in terms of the Arctic and circumpolar world, even if the country's commitment to the northern policy dimension has often been questioned. By contrast, the Antarctic has been viewed as an area of marginal significance, as demonstrated by the Canadian government's lack of involvement in antarctic research or the operations of the Antarctic Treaty system. In 1988 accession to the Antarctic Treaty appeared to mark a change of course regarding Canada's 'Far South'. Certainly, a series of Canadian policy interests regarding Antarctica can be identified, and it is easy to forget that in reality Canadians (as opposed to the Canadian government) have always been active in antarctic exploration and research. Today, it seems likely that Canada makes more money out of Antarctica through sales of polar equipment and expertise than any other country. It remains difficult to evaluate whether Canada will develop a more active bi-polar role or seek Antarctic Treaty Consultative Status. But, if Canada decides to do more, there exists already a strong foundation for future activity. (Auth.)

M-44669

Moneta, C.J., ed, **Antarctica in the international system of the future** [La Antártida en el sistema internacional del futuro], Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, 301p., In Spanish. Refs. passim. For individual papers see A-44681 through A-44683 and M-44670 through M-44680.

DLC JX4084.A5A59

This volume is a collection of papers with the objective of identifying, and possibly solving, changing problems related to economic interests and strategic and environmental concerns of the international community in Antarctica. The entire text of the Convention for the Regulation of Antarctic Resource Activities is presented in the Appendix.

M-44670

Moneta, C.J., **Antarctica and the South Atlantic in the international system: perceptions, interests, and conflict and cooperation possibilities** [La Antártida y el Atlántico Sur en el sistema internacional: percepciones, intereses y posibilidades de conflicto y cooperación], *Antarctica in the international system of the future*. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.11-37, In Spanish. 11 refs.

DLC JX4084.A5A59

The changes of the role of Antarctica in the international system are examined through an analysis of the following: the activities of various national, international and private organizations regarding the exploitation and conservation of antarctic resources, including the increased interest of developing countries in the exploitation and management of such resources; the strategic importance of the South Atlantic Ocean, from an economical and political point of view; and the unresolved conflicts under the Antarctic Treaty, including polarizations and alliances of the Treaty members as a function of different, and sometimes contradictory, interests. The various possibilities of cooperation between Latin American countries in assigning priorities to antarctic scientific and technological research are discussed.

M-44671

Solá, J.V., **Political orientations in Antarctica. Introductory commentaries** [Orientaciones políticas en la Antártida. Algunos comentarios introductorios], *Antarctica in the international system of the future*. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.39-42, In Spanish. 2 refs.

DLC JX4084.A5A59

A chronology of sovereignty claims in Antarctica by various nations, beginning with the United Kingdom in 1907 and 1914, is reviewed, and a brief analysis of the Antarctic Treaty and of the interests of the principal consultative parties is presented.

M-44672

Fraga, J.A., **Argentina and antarctic resources** [La Argentina y los recursos antárticos], *Antarctica in the international system of the future*. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.43-46, In Spanish.

DLC JX4084.A5A59

After a review of historic antecedents and the geopolitical position on which Argentina bases its territorial claims in Antarctica, an analysis is presented of the options Argentina would have to maintain its political and economic privileges in Antarctica, whether or not its sovereignty claims gain recognition through the Antarctic Treaty.

M-44673

Davis, B.W., **Australia and Antarctica: a changing relationship?** [Australia y Antártida: una relación que cambia?], *Antarctica in the international system of the future*. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.47-64, In Spanish. 35 refs.

DLC JX4084.A5A59

An evaluation is made of the Australian policy in Antarctica, which is currently based on three main suppositions: that Australia continues to be part of, and operate through, the Antarctic Treaty; that it keep the claims to its antarctic and subantarctic territories and adjacent waters; and that it continue exploring its territories and resources within the framework of international cooperation, as well as on its own. The legislative and political processes, and the administrative apparatus concerning Australian operations in Antarctica, are

discussed. A list of institutions involved in 1984 operations is appended.

M-44674

Auburn, F.M., **United States and the resources of the southern ocean** [Los recursos de los océanos australes y los Estados Unidos], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.93-111, In Spanish. 32 refs.

DLC JX4084.A5A59

A critical review is presented of the evolution of the antarctic policy of the United States. On the premise that the position of the United States is reflected in Article 4 of the Antarctic Treaty, the alleged legal and logical difficulties of this position are discussed. The emergence of antarctic mineral and marine resources as a political problem, related to sovereignty claims allegedly not recognized by the United States, is stressed.

M-44675

Auburn, F.M., **Antarctic policy of the Soviet Union** [La política antártica de la Unión Soviética], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.113-118, In Spanish. 40 refs.

DLC JX4084.A5A59

This article is based on observations contrasting the position of the United States within the antarctic regime with the position of the Soviet Union on major substantive issues arising within the content of this regime. A study is made of Soviet participation in the affairs of the southern continent, its dealing with mineral and living resources, the Soviet entry into the Antarctic Treaty, its stand on territorial claims, particularly exemplified by the strategic location of Soviet antarctic stations, and its scientific research throughout the continent.

M-44676

Ribeiro de Bakker, M.P., **Problems of Antarctica and the position of Brazil** [Los problemas de la Antártida y la posición de Brasil], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.119-131, In Spanish.

DLC JX4084.A5A59

After a brief description of the entry of Brazil into the Antarctic Treaty, and of national organizations responsible for activities in Antarctica, the discussion turns to national interests and the political, economic and scientific reasons that would entitle Brazil to a claim in Antarctica. It is emphasized that the position of Brazil is one of loyalty to the Antarctic Treaty and of support for a rational economic exploitation of antarctic resources, by the Treaty members and under the Treaty's control.

M-44677

Mercado Jarrin, E., **Potential conflicts in Antarctica. Peru's interests** [Conflictos potenciales en la Antártida. Los intereses del Perú], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.133-141, In Spanish. 5 refs.

DLC JX4084.A5A59

The strategic importance of the Weddell Sea, the Antarctic Peninsula and the Bellingshausen Sea for control of sea routes linking the Pacific, Atlantic and Indian Oceans, and the rivalry among many nations to dominate the southern continent, are discussed. Factors

which would entitle Peru to a claim in Antarctica are reviewed, and measures necessary to ensure Peru's continuous presence in Antarctica, involving various government agencies, are proposed.

M-44678

Zain-Azraai, D., **Antarctic Treaty System from the perspective of a nation not part of the System** [El sistema del Tratado Antártico desde la perspectiva de un Estado que no es parte del sistema], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.143-149, In Spanish.

DLC JX4084.A5A59

A critical analysis is presented of the position of the Antarctic Treaty Consultative Parties (ATCP) and the Non-Consultative Parties on their rights to regulate antarctic affairs. This is followed by a discussion on how the non-Treaty Parties should argue against such a position, considering Antarctica as the common heritage of mankind. It is found most unfortunate that a former proposal that a United Nations Committee be formed to consider future regulation of antarctic resources—which would reconcile all legitimate interests—was categorically opposed by the ATCP.

M-44679

Hamzah, B.A., **Antarctica and the new international regime** [La Antártida y el nuevo régimen internacional], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.151-161, In Spanish. 6 refs.

DLC JX4084.A5A59

An argument is presented against the Antarctic Treaty, in that it does not provide guidance and protection in the development of antarctic resources, and against the position of the Antarctic Treaty Consultative Parties, in that it lacks a legal basis. The need for a new, legal and flexible regime, supported by the international community, is stressed.

M-44680

Child, J., **Antarctica and South American geopolitical thought** [La Antártida y el pensamiento geopolítico sudamericano], Antarctica in the international system of the future. Edited by C.J. Moneta, Buenos Aires, Programa RIAL/Centro Latinoamericano de Estudios Estratégicos (CLEE), 1988, p.185-200, In Spanish. 14 refs.

DLC JX4084.A5A59

This article attempts to synthesize the relationship between the geopolitical thought of the Southern Cone and Antarctica, and to evaluate a number of possible results in that continent, especially those affected by the geopolitical modes of thinking. Three groups of possible scenarios of the current situation in Antarctica are described: the cooperative, the conflicting and the mixed. The group considered to be the most rational is the one that would allow an expansion of the number of members in the Antarctic Treaty System, thus strengthening the Third World nations' position in the international cooperation framework, and having a calming influence on the more aggressive non-member nations.

M-44690

Vallesi, A., **Legal regime of Antarctica in international law** [Il regime giuridico dell'Antartide nel diritto internazionale], *Il polo*, Mar. 1991 Vol.1, p.26-34, In Italian. 13 refs.

The legality of the division of Antarctica, and the sector claim theory based on the principle of continuity and geographic proximity,

are discussed in the framework of the articles of the Antarctic Treaty. New theories on the subject are analyzed, such as one that would consider Antarctica common property of mankind; the decolonization theory, based on the assumption that the claimant state considers its sector a colony; and the theory of the social function of Antarctica, based on the same principle as found in many post World War II Constitutions which, although recognizing and protecting private property, assigns priority to the general interests of all.

M-44691

Vallesi, A., **Legal regime of Antarctica in international law** [Il regime giuridico dell'Antartide nel diritto internazionale], *Il polo*, June 1990 Vol.2, p.47-54, In Italian. 9 refs.

A brief analysis of the position of various nations in Antarctica, on an international level and in a historic framework, is presented. The claimant states reviewed are the United Kingdom, Australia, New Zealand, France, Norway, Chile and Argentina. The different positions of nations with no territorial claim in Antarctica, such as the United States, the Soviet Union, Belgium, South Africa and Japan, are contrasted. No valid international legal precedent is found to justify the argument of the Soviet Union, in particular, against the division of the continent into sector claims by certain states.

M-44846

Scully, R.T., **Protecting Antarctica: progress in Chile**, *Antarctic journal of the United States*, Mar. 1990 26(1), p.4-10.

In this report on the Eleventh Special Consultative Meeting in Viña del Mar, Chile, the author's remarks were made to members of the Antarctic Society based in Washington, D.C. The focus of the SCM was on the protection of the antarctic environment. It was an attempt to find common points of agreement among opposing views on how the protection should be carried out, given the demise of the minerals regime convention. It appears that prospects of resolving divergent views are reasonably good. For parallel and supplemental commentaries on the Viña del Mar conference, see *Antarctic journal of the United States* 25(1), 1990 (A-42833) and *International challenges* 11(1):77-90, 1991 (M-44149).

M-44907

Beltramino, J.C.M., **International relations and international law in Antarctica. A geographical approach**, 1987, 18p., Unpublished manuscript.

The subject of this lecture, held on Mar. 6, 1987, at Leopold Franzens University, Innsbruck, Austria, addresses the need to examine more closely the links between international relations and geography, on one hand, and international law and geography, on the other hand. An attempt is made to demonstrate that both aspects are of particular relevance with reference to Antarctica.

M-44908

Beltramino, J.C.M., **Antarctic Treaty System. Functional and conventional norms for the ATS** [Sistema del Tratado Antártico. Su normatización funcional y convencional], *Revista del Colegio de Abogados de Buenos Aires*, Mar. 1988 48(1), p.67-86, In Spanish. 8 refs.

The principal characteristics of the Antarctic Treaty System are described, and the quality of its function is examined in the light of the original instrument, the Antarctic Treaty, on which the System is based. The process of discussion and adoption of recommendations during meetings of Consultative Parties, and the legality of the latter, are analyzed. It is concluded that the nations interested in Antarctica have developed a functional and conventional set of International Law norms conducive to peaceful individual and joint activities among them. Some suggestions are made regarding future activities in Antarctica which the Antarctic Treaty System should consider.

M-44913

U.S. Congress. House. Committee on Science, Space and Technology. Subcommittee on Science, NSF **Antarctic Environment Act of 1991. Hearing**, Washington, D.C., U.S. Government Printing Office. 1991, 158p.

The Committee convened on May 14, 1991 to consider proposed legislation intended to strengthen NSF's activities in support of environmental protection and tourism control in Antarctica. To gain further insight into the nature and character of the antarctic environment, the programs and operations currently in being to protect that environment, and the ways in which present efforts would be improved or jeopardized by the legislation being examined, testimony was taken from a group of experts representing a broad spectrum of knowledge and experience. Those who testified included Dr. Robert Correll, accompanied by Dr. Peter Wilkniss, National Science Foundation; Evelyn Hurwich, the Antarctic Project; Bruce Manheim, Environmental Defense Fund; Susan Sabella, Greenpeace; Dr. Robert Rutford, University of Texas; and Dr. Cornelius Sullivan, University of Southern California. Among the witnesses there was general agreement in principle; disagreements usually lodged on responsibilities, methods, or timing, or some combination of these.

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Geographic distribution

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Geography

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See [also]: Geomagnetism; Paleomagnetism

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 Unprotected larval development in the antarctic scallop *Adamussium colbecki* (Mollusca: Bivalvia: Pectinidae) [1991, eng] **B-44437**
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See: Bryophyta-Musci

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Sudden warming

See under: Stratosphere

Sunspots

See under: Solar activity

Supply

See: Food supply; Logistics; Transportation

Surface features

Used as subordinate term under various types of ice (snow)

Surveys

See under: Geomagnetic field. *See also:* Geodetic survey; Seismic exploration; Topographic survey

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